

Message

From: John Crouch [crouch@hpba.org]
Sent: 5/31/2017 4:37:18 PM
To: Blais, Gary [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=27409ad3df004224aa4370ff66afec8b-GBLAIS]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Sanchez, Rafael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d26b2afd849e403fa022a1e14e5de7ff-Sanchez, Rafael]
CC: Lisa Rector (lrector@nescaum.org) [lrector@nescaum.org]; John Ackerly (jackerly@forgreenheat.org) [jackerly@forgreenheat.org]; Brockman, Larry [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=ce3f1e78ce324bfa9a1d69b1ac2b5c57-Brockman, Larry]; Rachel Feinstein [feinstein@hpba.org]; Bob Ferguson (bob@far-consulting-vt.com) [bob@far-consulting-vt.com]; Ryan Carroll [carroll@hpba.org]; Jack Goldman [goldman@hpba.org]
Subject: Comments from HPBA on new EPA web site
Attachments: HPBA Comments on EPA Wood Heater Database.pdf; HPBA Detailed Comments on Web Portal Pages May 31 2017.docx

Gary, Adam, and Rafael,
Attached are the collective comments from HPBA on the draft of the new website.

Rachel has compiled a number of detailed comments from both Bob and myself.
Also included is a page of more conceptual comments. We have referenced Lisa and John's comments in a couple of places, and mentioned Larry, so I thought it appropriate to include him on the cc.

As we have said, and continue to say, over and over, we cannot comment on the accuracy of the data.
Only the manufacturers, and Rafael know if those numbers are correct.
Thanks for the opportunity to comment.

John Crouch
Director of Public Affairs
Hearth, Patio & Barbecue Association
Sacramento, California Office
916.536.2390
916.717.1209 Mobile
Main office, Arlington, VA
[Visit us online today!](#)



EXHIBITION: MARCH 8-10, 2018
EDUCATION: MARCH 7-9, 2018
MUSIC CITY CENTER | NASHVILLE, TN
[SAVE THE DATE](#) | [VISIT US ONLINE](#)



Suite 600, 1901 North Moore Street
Arlington, VA 22209 USA
Phone: (703) 522-0086 • Fax: (703) 522-0548
Email: governmentaffairs@hpba.org
Website: www.hpba.org

Comments of the Hearth, Patio & Barbecue Association

May 31, 2017

1. I'm sure all the manufacturers will agree with me that we are pleased US EPA has undertaken this project, it is long overdue.

2. Consumers will be accessing this database, much more than local/state/tribal air folks.

Consumers will know little, if any, of the background of this subject. If this database unintentionally confuses consumers they will do one of two things: Argue with retailers, and/or send emails to EPA. As I think Larry knows from being one of the contacts on Burn Wise, there can be a lot of consumer questions in the fall. Confusion over the presentation of the material in this website could potentially trigger dozens of email each fall.

Therefore, notwithstanding deadlines, it's worth taking the time to get this correct, now.

3. HPBA cannot be responsible for the accuracy of the US EPA's data. The only method to double check this data, is for OECA to reach out to the individual entities. This need not be the manufacturers, but could be the 3rd party entities. The reason HPBA proposed 3rd party verification was to lighten EPA's load, and this is certainly a legitimate item to seek their assistance on. The accuracy of this data base will drive consumer purchase, and must be taken very seriously. The absence of a product from this list, or the mischaracterization of a product on this list could literally cost a person his job.

As for the specific questions:

As you conduct your review please keep in mind that we are primarily interested in knowing the following:

Q1: Is the data accurate?

As indicated, there is no way HPBA can answer this. EPA does not alert us when a certificate is issued, nor do manufacturers, so we are not a repository for this information. I know that Chris Neufeld has commented regarding Blaze King's data. I have forwarded this note to the co-chair of our manufacturer Solid Fuel Section, Dave Lal of Regency. Dave has indicated that he does not believe that all of their information is correct, nor are all of their certified stoves listed.

Not data-related, but at the bottom of each page, “Burnwise” should be spelled “Burn Wise.” This is at the bottom of each page:



Q2: When searching the data, can you get what you want? Are you getting what you expect?

Q3: Are definitions clear and easy to understand?

Starting with the web pages:

1. Home page: ABOUT WOODSTOVE DATABASE

(<https://cfpub.epa.gov/oarweb/woodstove/index.cfm?fuseaction=app.about>)

- I strongly recommend that this page title be, “About Woodstove and Central Heater Database”
- I would move the “Use the links at the left....” sentence up, before “Contact Rafael Sanchez for support...”
- The sentence “To learn more about the 2015 NSPS...” should be at the end as it will confuse and sidetrack consumers who may erroneously click on it first.
- You might also add another line, underscoring the need to read the background info first. (otherwise they will not read it, and Rafael will get questions about things already covered by the website - as will Larry, “Mr. Burn Wise”, and, as will I.) The background material is critical.

2. Woodstove Database Search Page

(<https://cfpub.epa.gov/oarweb/woodstove/index.cfm?fuseaction=app.search>)

- **The pop-ups are great!** But I recommend including instructions on how to view the pop-up definitions, or placing a small question mark next to or under each column header to indicate that there is more information. If this isn’t included, Rafael will likely see a LOT of emails asking questions that are answered by those boxes. Some of us involved in this small review process didn’t realize the pop-up definitions were there.
- **Looks to me like I have to know what I’m searching for, exactly.** If I miss-spell Lopi, or Avalon, or Woodstock, I am out of luck. I see that there is a dropdown list of manufacturers in the Advanced Search function, but perhaps you should **move this search field over to the Basic Search?** Most consumers will come to this list looking specifically for a manufacturer or brand. I didn’t realize at first that you could search by manufacturer until the Advanced Search was pointed out to me.

- **The BTU range slider in the upper search box.** I'm not clear how this helps a consumer. Perhaps the BTU range slider should be moved to the "Advanced Search" options where the emission rate and efficiency sliders are located? The 'raw' data on BTU's is in the table, but, as John Ackerly points out, this leaves out a LOT of conceptual background info, Which is explained in the background doc, but not obvious from the table. Either a separate Column, or an indicator, such a "E", for estimated, and "M" for measured. In that context, the default could be listed and a "D" for default could be included. The hope is that this would encourage the consumer to go to the background doc and review what each of these means. As Adam and I discussed several times during the preparation of the Step 2 Temporary Hang Tags, giving consumers BTU data is fraught with issues, and certainly can do more harm than good. It has already been pointed out that all this BTU data is based on Method 28 and the very light load it requires. Not to mention that cat stoves and non-cat stoves will always very different btu/hour metrics, because of the way they work.
- **Fuel. CHIPS. Rafael** , we find 9 stoves listed here as using wood chips. I urge you to double check that. I'm not clear that ANY of these are tested with wood chips, certainly not the ICC Delta Fusion, their Single Burn rate Zero Clearance unit. Your email will light up if this site goes live with that data!
- **CO.** I would urge you to reconsider including this column. At some point in the future, there will be enough data to make this column meaningful to consumers, but right now, I find only 3 units out of the entire 593 records that show a value for this, all pellet stoves, and with a range that varies by 2 orders of magnitude. Again, thinking like consumers I have known, this will generate far more questions than need be.
- **The Quick Search options on the right hand side, "Cleanest," "Most Efficient," "Previously EPA Certified."**
 - How would I know that I needed to use the 'Previously' list to search for an older stove? Should this list be a separate list accessible on the left-hand side of the page (like the separate lists for Room Heaters and Central Heaters)? A consumer who needs to verify the status of an older stove may miss this subtle mention on the general Room Heater page.
 - When I do the Quick Search for "cleanest," the results are generated and the Advanced Search options are also displayed. Why are the drop-downs for Manufacturer, Type, Subtype, and Fuel Type not included in the Basic Search on the first page?
- Finally, if I'm a consumer, and I see a column that says "NSPS Compliant 2020" do I automatically know what that means? Might I think it meant that I couldn't use this stove after 2020? Since the column is blank, this column could fuel the rumor that EPA

is banning woodstoves Someone will write their Congressman. IF you must include something about 2020, it needs to be explained differently (suggested wording in attached document). Right now, the column appears to underscore that there are no stoves yet certified properly to be sold after 2020 (which we no isn't correct). The pop-up definition currently displayed for this column says that stoves marked with YES means that it meets the 2015 standard.

3. Central Heaters

(<https://cfpub.epa.gov/oarweb/woodstove/index.cfm?fuseaction=app.searchwh>)

- Again, the search terms in Basic Search on opening has no hint, default, or dropdown terms, just a blank line. The search functions in Advanced Search for Manufacturer, Type, Subtype, and Fuel Type should be included in the Basic Search. The search sliders should be moved to the Advanced Search.
- Lisa has commented on this so I'll not repeat her comments here, but I find it interesting that there are no units listed with wood chips. This is where I would expect to find one or two. Lisa is spot on about the need for footnotes or other indication of a requirement for separate storage, or partial thermal storage under Hydronic Heaters. These approaches are all so different that they should be separated in the sub-type menu, since you approach the sizing of these products differently based on their type of, or absence off, any thermal storage.

Our more detailed and specific comments on the pop-up definitions, descriptions, and background text can be found in the attachment to this email titled "HPBA Detailed Comments on Web Portal Pages May 31 2017." We noticed that the pop-up definitions on the website and those listed in your April 21 document are **different**. We commented only on the definitions currently on the website. If you are going to use the pop-up definitions listed in your original document, please let us know and we will provide comment on those.

Finally, I'll underscore the need to be certain this is correct before rolling it out. It would be useful to test this on some consumers, and/or some retailers. If this information is confusing, it will generate emails, and, on an issue which is highly charged, like residential wood burning and wood burning appliances, may spark untrue rumors which all of us will have to chase down.

Thank you again for this opportunity and we look forward to seeing this effort come to fruition.

Comments of the Hearth, Patio & Barbecue Association

May 31, 2017

EPA CERTIFIED WOOD HEATER DATABASE

This database contains the manufacturer's name, model name, appliance type, and performance information (emission rate, heat output, efficiency, carbon monoxide among other records) for residential wood heaters approved by the Environmental Protection Agency for sale in the United States.

Room Heaters

Room heaters, as the name suggests are intended to heat only the room they are in. Room heaters include free-standing wood stoves and pellet stoves, and fireplace inserts that burn either cord wood or wood pellets.

Room Heater
Search Button

Central Heater

Central heaters are intended to heat an entire home, distributing heat from a residential hydronic heater or residential furnace unit (small or large), which can be located inside or outdoors via either water pipes in the case of hydronic heaters (aka, wood boilers) or air ducts in the case of forced-air furnaces.

Central Heater
Search Button

EPA CERTIFIED WOOD HEATER DATABASE

Background

Residential wood combustion (RWC) emissions are a significant national air pollution problem and human health issue. RWC emissions occur in many neighborhoods across the country, including minority and low-income neighborhoods, and impact people in their homes. Nationally, residential wood combustion accounts for 44 percent of total stationary and mobile emissions of polycyclic organic matter (POM) – compounds present in the air as particles formed mainly from combustion. RWC POM accounts for nearly 25 percent of all area source air toxics cancer risks and 15 percent of noncancerous respiratory effects. RWC causes many counties in the United States to either exceed the U.S. Environmental Protection Agency's (EPA) health-based National Ambient Air Quality Standards (NAAQS) for fine particles or places them on the cusp of exceeding those standards.

Commented [RF1]: This background section is different compared to what is currently on the website. Which version is being used?

RWC emissions from residential wood heaters contributes significantly to particulate air pollution. Exposure to particulate air pollution can result in short-term health effects ranging from irritated eyes to asthma attacks; and long-term health risks such as an increased risk of cancer, reduced lung function, and chronic bronchitis.

Commented [RF2]: What does this link to?

To address RWC emissions and health concerns, and to comply with the Clean Air Act requirements under Section 111b and Section 114, the EPA revised its standards for new residential wood heaters on May 15, 2015 (Wood Heater New Source Performance Standards (NSPS)). Under the NSPS, the EPA certifies wood heaters that employ the latest technology and meet the particulate matter limits established by the Wood Heater NSPS. ~~The Wood Heater NSPS requires manufacturers to produce new wood heaters that are 50 percent more efficient at burning wood and 70 percent less polluting than wood heaters manufactured before 1990.~~ Wood heater model lines that comply with the Wood Heater NSPS are referred to as **EPA-certified wood heaters**.

Pursuant to the 2015 Wood Heater NSPS manufacturers may manufacture, offer for sale, or import a wood heater into the United States after applying for and obtaining an EPA Certificate of Compliance from the EPA. Similarly, retailers, wholesalers, importers, and distributors of heaters may offer for sale heaters that have an EPA permanent label affixed to it.

Background Currently on Website (different from original attachment):

Background

Residential wood heaters, which includes wood and pellet stoves, hydronic heaters and forced-air furnaces, contribute significantly to particulate air pollution. Exposure to particulate air pollution can result in short-term health effects such as irritated eyes and respiratory systems and asthma attacks; and long-term health risks such as an increased risk of cancer, reduced lung function, and chronic bronchitis.

Since 1988, the EPA has regulated wood heater particulate emissions, monitoring and enforcing emission standards and limits to reduce the health risks for populations exposed to particulate air pollution.

Wood heater model lines that are in compliance with the rule are referred to as EPA-certified wood heaters.

EPA CERTIFIED WOOD HEATER DATABASE

On February 3, 2015, the United States Environmental Protection Agency (EPA) Administrator signed a final rule updating the 1988 wood heater regulations (New Source Performance Standards, or NSPS) and creating new requirements and standards for hydronic heaters and forced- air furnaces. The final rule was published in the Federal Register on March 16, 2015 (80 Fed. Reg. 13672) and became effective on May 15, 2015.

All wood heaters manufactured, imported into the United States, and/or sold at retail on or after May 15, 2015, must meet the EPA emission standard and have a valid EPA certification of compliance. This rule does not affect existing products already installed in homes.

This database contains wood heaters certified under both the 1988 NSPS and the 2015 NSPS. Today, retailers and manufacturers can only make and offer for sale wood heaters that meet the 2015 NSPS regulations.

For information about the USEPA program for wood burning fireplaces go [here](#)
Like Want to know more? Click here for more information provided by Burn Wise.

Commented [JC3]: Somewhere in this there needs to be a link to the voluntary fireplace program. If this is not the place, then a better spot should be found. It would not hurt to have this link appear in several places on the site.

EPA CERTIFIED WOOD HEATER DATABASE

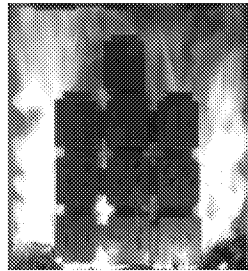
Regulatory Definitions

Adjustable Burn Rate Wood Heater: a wood heater that is equipped with or installed with a damper or other mechanism to allow the operator to vary burn rate conditions, regardless of whether it is internal or external to the appliance. This definition does not distinguish between heaters that are free-standing, built-in or fireplace inserts.

Catalytic Combustor: a device coated with a noble metal used in a wood heater to lower the temperature required for combustion.

Central Heater: a fuel-burning device designed to burn wood or wood pellet fuel that warms spaces other than the space where the device is located, by the distribution of air heated by the furnace through ducts or liquid heated in the device and distributed typically through pipes. Unless otherwise specified, these devices include, but are not limited to, residential forced-air furnaces (small and large) and residential hydronic heaters.

Crib wood is a specified configuration and quality of dimensional lumber and spacers, usually cut 2"x4" or 4"x4" lumber that is stapled together. This configuration was intended to improve the repeatability of wood burning emissions test methods, it is not reflective of real world use when compared to cord wood testing.



Overall Efficiency: the performance level of the wood heater as determined by using the method included in method CSA B415.1-10 Performance Testing of Solid-Fuel-Burning Heating Appliances. This information is for comparison only as it is based on a fire using Crib Wood, and is not reflective of real world use when compared to cord wood.

Combustion Efficiency: A measure of how completely the wood fuel is burned.

Heat Transfer Efficiency: The measure of how effectively the heat produced by burning the wood fuel is delivered to the room (or house).

Emission Rate Annual Avg-Average (lb/mmBTU) - Particulate matter (PM2.5) emissions expressed in a weighted annual average of mass per unit of energy. This value is based on measurements made on the load side of the heat exchanger.

Pellet Stove (sometimes called pellet heater or pellet space heater): an enclosed, pellet or chip fuel-burning device capable of and intended for residential space heating or space heating and domestic

Commented [JC4]: John A has also addressed this, I'm afraid that if you don't say this, it will be missed. Comparison only!

Formatted: Font: Bold

Formatted: Font: Bold

EPA CERTIFIED WOOD HEATER DATABASE

water heating. Pellet stoves include a fuel storage hopper or bin and a fuel feed system. Pellet stoves include, but are not limited to:

- Free-standing pellet stoves--pellet stoves that are installed on legs or on a pedestal or other supporting base. These stoves generally are safety listed under ASTM E1509, UL-1482, ULC S627 or ULC-ORD C1482.
- Pellet stove fireplace inserts--pellet stoves intended to be installed in masonry fireplace cavities or in other enclosures. These stoves generally are safety listed under ASTM E1509, UL-1482, ULC-S628 or ULC-ORD C1482.
- Built-in pellet stoves--pellet stoves intended to be recessed into the wall. These stoves generally are safety listed under ASTM E1509, UL-127, ULC-S610 or ULC-ORD C1482.

Residential Forced-Air Furnace: Forced-Air Furnaces (FAFs) are divided into two categories – small and large – depending on their heat output. For each FAF category, the compliance dates and PM emission limits are as follows:

- On May 16, 2016 - Small forced-air furnaces (< 65,000 BTU per hour) must meet the following PM emission limit $\leq 0.93 \text{ lb/mmBTU}$ heat output (weighted average, using cord wood or pellets), See §60.5474(b)(4);
- On May 15, 2017 - Large forced-air furnaces ($\geq 65,000 \text{ BTU per hour}$) must meet the following PM emission limit $\leq 0.93 \text{ lb/mmBTU}$ heat output (weighted average, using cord wood or pellets), See §60.5474(b)(5);
- On May 15, 2020 – Small and Large forced-air furnaces must meet the following PM emission limit $\leq 0.15 \text{ lb/mmBTU}$ heat output for each individual burn rate (using cord wood or pellets). See §60.5474(b)(6).

o All applicable NSPS sections: <https://www.gpo.gov/fdsys/pkg/FR-2015-03-16/pdf/2015-03733.pdf>

Residential Hydronic Heater: a fuel burning device designed to burn wood or wood pellet fuel for the purpose of heating building space and/or water through the distribution, typically through pipes, of a fluid heated in the device, typically water or a water and antifreeze mixture. These devices must comply with the following compliance dates and particulate matter (PM) emission limits:

- On May 15, 2015 - PM emission limit $\leq 0.32 \text{ lb/mmBTU}$ heat output based on the {weighted average of results from four burn rate categories} and a cap of 18 g/hr for each individual burn test rate run (using crib, pellets or cord wood). See §60.5474(b)(1);
- On May 15, 2020- PM emission limit $\leq 0.10 \text{ lb/mmBTU}$ heat output for each individual burn rate (using crib wood or pellets); or an optional emission limit of 0.15 lb/mmBTU heat output if tested with cord wood. See §60.5474(b)(1);

o All applicable NSPS sections: <https://www.gpo.gov/fdsys/pkg/FR-2015-03-16/pdf/2015-03733.pdf>

Commented [JC5]: Shouldn't chips be in here?

Room Heater: an enclosed, wood burning-appliance capable of and intended for residential space heating or space heating and domestic water heating. These devices include, but are not limited to, adjustable burn rate wood heaters, single burn rate wood heaters, fireplace insert wood heaters and pellet stoves. Wood heaters may or may not include air ducts to deliver some portion of the heat produced to areas other than the space where the wood heater is located. Wood heaters include, but are not limited to:

EPA CERTIFIED WOOD HEATER DATABASE

- Free-standing wood heaters-- Wood heaters that are installed on legs, on a pedestal or suspended from the ceiling. These products generally are safety listed under UL-1482, UL-737 or ULC-S627.
- Fireplace insert wood heaters-- Wood heaters intended to be installed in masonry fireplace cavities or in other enclosures. These appliances generally are safety listed under UL-1482, UL-737 or ULC-S628.
- * Built-in wood heaters--Wood heaters that are intended to be recessed into the wall. These appliances generally are safety listed under UL-1482, UL-737, UL-127 or ULC-S610.
- * For all room heaters, the PM emission limits are:
 - On May 15, 2015 - PM emission limit ≤ 4.5 grams/hour based on the (weighted average) of results from four for each individual burn rate categories (using crib or cord wood). See §60.532(a)
 - On May 15, 2020 - PM emission limit ≤ 2.0 grams/hour based on the (weighted average of results from four burn rate categories) ~~on using~~ crib wood or an optional limit of 2.5 grams/hour if tested with cord wood. See §60.532(b)
 - All applicable NSPS sections: <https://www.gpo.gov/fdsys/pkg/FR-2015-03-16/pdf/2015-03733.pdf>

Commented [RF6]: I thought you could only use crib wood in Step 1 for room heaters?

Single Burn Rate Wood Heater: a wood heater that is not equipped with or installed with a burn control device to allow the operator to vary burn rate conditions. Burn rate control devices include stack dampers that control the outflow of flue gases from the heater to the chimney, whether built into the appliance, sold with it, or recommended for use with the heater by the manufacturer, retailer or installer; and air control slides, gates or any other type of mechanisms that control combustion air flow into the heater.

Chip Wood Chip Fuel: wood chipped into small pieces that are uniform in size, shape, moisture, density and energy content.

Wood Pellet Fuel: refined and densified solid wood shaped into small pellets or briquettes that are uniform in size, shape, moisture, density and energy content.

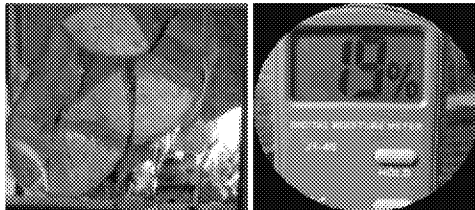
EPA CERTIFIED WOOD HEATER DATABASE

Non-regulatory Terms

Cord of Wood: firewood arranged in a stack 48 feet wide, 4 feet high and 82 feet deep. EPA recommends that cord wood be dried to a moisture level of no more than 20% to improve combustion and lower air pollutant emissions.

Moisture Meter: A moisture meter is a simple and relatively inexpensive device available in many hardware stores that you can use to measure the moisture of your firewood. It must be properly used to provide usable estimates of fuel moisture.

Formatted: Font: Bold



For more information about burning wood for heat safely and responsibly go to:

<https://www.epa.gov/burnwise/burn-wise-best-burn-practices>

Fireplace Insert: a type of heater/stove that is intended to be installed in masonry fireplace cavities or in other enclosures. (Please refer to section 60.531 of the Wood Heater NSPS for full definition). designed to fit inside the firebox of an existing wood-burning fireplace (Wood Heat Organization, 2010). EPA-certified fireplace inserts are essentially wood heaters/stoves without legs or pedestals. An insert is made of steel or cast iron and is typically installed in masonry fireplaces or traditional fireplaces in order to provide effective heating (Hearth, Patio, and Barbecue Association [HPBA], 2010b).

Commented [RF7]: I changed the wording here to match the NSPS, so you can cite the EPA's own regulatory definition here.

Commented [RF8]: I added a link to HPBA's website for this citation.

Wood Pellets: are usually made of wood from discarded wood products (sawdust, wood waste, etc) which is compressed into small pellets. Wood pellets burn more efficiently than cord wood because of their uniform dimensions, low moisture, density, and energy content.

Commented [RF9]: Wood pellets are defined in the regulatory terms section. Can this be deleted?

EPA CERTIFIED WOOD HEATER DATABASE



Pop-up Definitions

Efficiency: the percentage of heat generated by a wood heater with a full load of fuel compared to the potential energy of that fuel.

Emission Rate Annual Avg (lb/mmBTU): the amount of particle air pollution emitted by a central heater in pounds per heat units, expressed in millions of BTU's (British thermal units).

Emission Rate Annual Avg (grams/hour): the amount of particle air pollution emitted by a room heater in grams of particle pollution per hour.

Residential Forced-Air Furnace: a central heater that uses wood (including cord wood, wood pellets or wood chips) as a fuel instead of oil or natural gas and operates the same way as any other central heater, distributing air heated by the furnace through ducts to other rooms in the home. Residential forced-air furnaces can be located indoors or outdoors. For a more detailed definition, please refer to section 60.5473 of the Wood Heater NSPS.

Residential Hydronic Heater: a central heater that uses wood (including cord wood, wood pellets or wood chips) as a fuel instead of oil or natural gas. Hydronic heaters, as known as wood boilers, can be located indoors or outdoors distributing heat through pipes carrying water heated by the furnace to the home. Once inside the home heat can be distributed to the entire home through pipes to baseboard radiators or blown by a fan through ductwork. It's also possible to store some of the heated water for showering and other household uses in a tank. Some units are equipped with thermal storage which can respond to heating demand and reduce the need to restart the heater throughout the day, thereby reducing wood use and pollution emissions. For a more detailed definition, please refer to section 60.5473 of the Wood Heater NSPS.

Heat output (BTUs/hour): a measure of the amount of heat produced expressed in British Thermal Units per hour. The heat output provides a way to correctly size the wood heater you need for your home and a way to compare one heater to another.

Commented [RF10]: These pop-up definitions don't match those actually on the current database website. We reviewed and commented only on the pop-up definitions on the website (comments on those below this section). Please let us know if the definitions on the website are not being used and we will review and comment on these definitions.

Commented [JC11]: This is a nice image of a pellet stove, but the bulk of the people using this will be looking for woodstove info, shouldn't this be a picture of a wood fire?

Commented [JC12]: I believe this is one of the first places that the NSPS is referenced specifically. Why is this the only one?

EPA CERTIFIED WOOD HEATER DATABASE

Type: room heaters include freestanding wood stoves and fireplace inserts which use either cord wood or wood pellets for fuel. Central heaters include residential hydronic heaters (aka, wood boilers) and residential forced-air furnaces.

Subtype: any wood heater, regardless of fuel type, can be equipped with a catalyst which is a device that improves combustion of gases created by the fire thereby reducing pollution emissions.

Commented [JC13]: Suggest you make clear that a catalyst must be engineered into the product when certified, but cannot be added (perhaps a footnote?)

Fuel Type: in most cases, wood heaters are designed to use one fuel type, either cord wood, wood pellets or wood chips and generally that is the fuel they were tested with and for which they were EPA-certified to use. Some wood heaters are sold as multi-fuel units which means fuels other than wood can be used in them but the fuel used to obtain the EPA certification must be clearly identified on the back of the unit. Manufacturers and retailers cannot sell multi-fuel heaters unless all fuels advertised have been tested even though the only fuel a heater can be certified for is cord wood, wood pellets, or wood chips. EPA cannot certify other fuels under the Wood heater NSPS but EPA will accept test reports for other fuels to gather test data in case other fuels are covered under the NSPS in the future. The user should not expect that the heater will achieve the EPA-certified emission rate if fuels other than wood are used.

Commented [JC14]: This section is confusing. The implication is that multi-fuel products exist, but can't be sold, because they can't be tested.

CO: carbon monoxide (CO) is a colorless, odorless, and tasteless gas that is slightly less dense than air. CO is a product of wood combustion and ~~is a colorless odorless gas that is a safety and health risk if~~ breathed for too long in a confined space. Manufacturers are required to report the CO level attained during EPA-certification testing in grams per minute.

NSPS Compliance 2020: some wood heaters emit air pollution at a very low rate and therefore already meet the 2020 emission limit of 2.0 grams per hour (if tested with crib wood) or 2.5 grams per hour (if tested with cord wood) as required by the Wood heater NSPS for room heaters; or the 2020 emission limit of 0.10 lbs/mmBTU (for hydronic heaters if tested with crib wood) or 0.15lbs/mmBTU (if tested with cord wood) for residential hydronic heaters and residential forced-air-furnaces.

Pop-Up Definitions Currently on the Website

Commented [RF15]: These are the actual pop-up definitions on the website currently. They are different from those listed in this document. Our comments are on these definitions. If the definitions provided in the document (those which immediately precede this section), please let us know and we will comment on those. We only reviewed the pop-up definitions on the website.

Room Heater Database

Quick Searches:

"Most Efficient": Efficiency as reported to EPA by the manufacturer is the ratio of the amount of energy produced and delivered to the home (heat output) to the energy content of the fuel. It is expressed as a percentage. For example, a room heater that is 70% efficient produces more heat than a room heater that is 60% efficient for the same amount of wood burned. This search returns the most efficient heaters in descending order. Combustion efficiency, which some manufacturers provide to consumers, is a measure of how ~~much completely the wood fuel has is~~ burned and has no relationship to how much heat is delivered to your home. Heat transfer efficiency is the measure of how effectively the heat produced by burning the wood fuel is delivered to the room (or house).

"Cleanest": This search returns the models that emitted the least amount of particulate matter air pollution (in grams per hour) during lab testing in descending order.

EPA CERTIFIED WOOD HEATER DATABASE

“Previously EPA Certified”: These heaters are certified to meet the 1988 New Source Performance Standard (in terms of PM_{2.5} emissions) for new residential wood stoves. ~~(1988 NSPS). They can no longer be manufactured, advertised, or offered for sale in the United States unless they meet the 2015 NSPS emission standards. If these heaters were installed in homes prior to the December 31, 2015, NSPS they can continue to be operated by a homeowner.~~

Column Pop-Up Definitions:

“Model”: Name of model submitted ~~assigned by the manufacturer to a product or family/series of products (a “model line”) for sales and marketing purposes. All wood heaters in a single model line are similar in all material respects that would affect emissions. Some lines may contain multiple models. All models in this line meet the 2015 NSPS.~~

“Manufacturer”: Name of ~~the entity that constructs or imports into the United States a wood heater, woodstove manufacturer.~~

Commented [RF16]: Definition from the 2015 NSPS.

“Emission Rate (grams/hr)”: ~~The emission of a pollutant expressed in mass (grams) per unit time (hour). Emission Rate (grams/hr) – 2015 particulate matter emission standards – each affected wood heater manufactured, imported into the United States, and/or sold at retail on or after May 15, 2015, must be certified to not discharge into the atmosphere any gases that contain particulate matter in excess of a weighted average of 4.5 g/hr (0.010 lb/hr).~~

Commented [RF17]: Consumers don’t need this level of detail. If you want it noted, the place for this is on the Background page.

“Heat Output Rate (BTUs)”: The average rate of energy output from the appliance, ~~measured in British Thermal Units (BTUs), during a specific test period. The higher the BTU number, the larger the space it can heat. This will help determine the correct size of heater for your room and allows for comparison with other heaters.~~

“Efficiency”: ~~Efficiency: Heat output divided by fuel input. The effectiveness of a heater to deliver the potential energy contained in a load of wood to a residential space. A missing overall efficiency value means that the heater was EPA certified under the 1988 NSPS, which did not require manufacturers to test their appliances for efficiency.~~

Commented [JC18]: Efficiency numbers are obtained burning artificial crib fuel and are for comparisons only. Efficiencies using cord wood will probably differ.

“Type”: The appliance type of the stove. Types of wood heaters subject to the ~~2015 NSPS include, but are not limited to, the following appliances: wood stoves or and pellet stoves.~~

Commented [RF19]: Don’t need to refer to 2015 in this context. There is just the current NSPS in current law.

“SubtypeEmissions Control Type”: ~~Types of wood heaters subject to the 2015 NSPS use varying emissions control systems including, but are not limited to, catalytic stoves that use a catalytic converter and non-catalytic stoves that don’t use a catalytic converter or are pellet stoves. the following appliances: noncatalytic and catalytic stoves.~~

“Fuel Type”: Type of fuel used during the certification tests for the subject wood heater: Cordwood, Chips, Pellets.

Commented [RF20]: There is possibility for confusion between “type” and “fuel type.” Some models are classified with the type “wood stove” and with the fuel type “wood pellets,” such as the 50-TNC Timber Ridge 13-NCI/50-TNC131 (Insert) by England’s Stove Works, Inc. What’s going on here?

“CO”: The concentration of carbon monoxide (CO) (measured in grams per minute) measured in the flue gas ~~during testing of this model. Carbon monoxide values are required to be reported only for heaters certified under after May 15, 2015, the 2015 NSPS.~~

EPA CERTIFIED WOOD HEATER DATABASE

"NSPS Compliance 2020": Indicates models meeting requirements that won't be required until May 15, 2020 for all affected wood heaters manufactured, sold, or imported. Models marked with YES have achieved the 2020 requirements before the effective date. Those marked with NO meet the current standards, may continue to be manufactured and sold until the 2020 effective date, and may continue to be used in your home after 2020.

This database lists wood heaters that have been certified by the EPA since 1988. Only wood heaters that meet the 2015 wood regulations are currently EPA certified and marked with a YES regarding whether it meets the 2015 NSPS or not.

There may be instances where a wood heater is marked NO and displays an emissions rate of less than 4.5 grams per hour. In such instances, it is likely that the manufacturer did not renew the heater's certificate of compliance.

Central Heater Database

Column Pop-Up Definitions:

"Model": Name of model submitted assigned by manufacturer to a product or family/series of products (a "model line") for sales and marketing purposes. All central heaters in a single model line are similar in all material respects that would affect emissions. Some lines may contain multiple models. All models in this line meet the 2015 NSPS.

Commented [RF21]: This sentence is unnecessary. If a model is listed on this list, that means they meet the 2015 standards.

"Manufacturer": Name of the entity that constructs or imports into the United States a central heater, woodstove manufacturer.

Commented [RF22]: Definition from the final 2015 NSPS.

"Emission Rate Annual Avg (lb/mmBTU)": The emission of a pollutant expressed in mass (pounds) per million BTU of heat output. Emission Rate ((lb/mmBTU)) - 2015 particulate matter emission standards - each affected wood heater manufactured, imported into the United States, and/or sold at retail on or after May 15, 2015, must be certified to not discharge into the atmosphere any gases that contain particulate matter in excess of a weighted average of 0.010 lb/hr.

Commented [RF23]: This sentence is unnecessary for consumers in this context. Also, 0.010 lb/hr is the emission rate for woodstoves, not central heaters.

"Heat Output Maximum (BTUs)": The maximum rate of energy that a wood central heater supplies in Btu/hr which is verified by testing at its highest burn rate. This value is based on measurements made on the load side of the heat exchanger.

"Heat Output 8 Hours (BTUs)": The average rate of energy output from the appliance for an 8 hour burn time. This number is included to assist consumers in appropriately sizing units to match the theoretical heat demand of their application.

Commented [RF24]: From final NSPS on page 63.

"Efficiency": Efficiency (for forced-air furnaces): The effectiveness of a furnace to deliver the energy contained in a load of wood through air ducts to spaces other than where the furnace is located. Efficiency (for hydronic heaters): The effectiveness of a heater to deliver the potential energy contained in a load of wood into the circulating water that heats a building's space.

"Type": The appliance type of the heater. Types of wood central heaters subject to the 2015 NSPS include, but are not limited to, the following appliances: hydronic heaters and forced-air furnaces.

EPA CERTIFIED WOOD HEATER DATABASE

“SubtypeEmissions Control Type”: Types of central heaters subject to the NSPS use varying emissions control systems including, but not limited to, catalytic heaters that use a catalytic converter and non-catalytic heaters that don’t use a catalytic converter or are pellet-fueled. wood heaters subject to the 2015 NSPS include, but are not limited to, the following appliances: noncatalytic and catalytic heaters.

“Fuel Type”: Type of fuel used during the certification tests for the subject wood heater: Cordwood, Chips, Pellets.

“CO”: The concentration of carbon monoxide (CO) (measured in grams per minute) measured in the flue gas during testing of this model. Carbon monoxide values are required to be reported only for heaters certified under the 2015 NSPS. Carbon monoxide values are reported only for heaters certified under the 2015 NSPS.

“NSPS Compliance 2020”: Indicates models meeting requirements that won’t be required until May 15, 2020 for all affected central heaters manufactured, sold, or imported. Models marked with YES have achieved the 2020 requirements before the effective date. Those marked with NO meet the current standards, may continue to be manufactured and sold until the 2020 effective date, and may continue to be used in your home after 2020. This database lists wood heaters that have been certified by the EPA since 1988. Only wood heaters that meet the 2015 wood regulations are currently EPA certified and marked with a YES regarding whether it meets the 2015 NSPS or not.

There may be instances where a wood heater is marked NO and displays an emissions rate of less than 4.5 grams per hour. In such instances, it is likely that the manufacturer did not renew the heater’s certificate of compliance.

Formatted: Space After: 0 pt, Line spacing: single

Message

From: Blais, Gary [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=27409AD3DF004224AA4370FF66AFEC8B-GBLAIS]
Sent: 4/21/2017 8:04:59 PM
To: lrector@nescaum.org; John Ackerly [jackerly@forgreenheat.org]; jcrouch@hpba.org; feinstein@hpba.org; Chris Neufeld [cneufeld@blazeking.com]
CC: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]
Subject: Wood Heater Database review
Attachments: Certified Db Draft Final Web Portal page April 21 2017.docx

Thank you for agreeing to review our online tool for EPA-Certified wood heaters. As you conduct your review please keep in mind that we are primarily interested in knowing the following:

- Is the data accurate?
- When searching the data, can you get what you want? Are you getting what you expect?
- Are definitions clear and easy to understand?
- Style comments are welcome but may be pushed back to version 2
- Functionality changes that require major recoding will be pushed.

Another point I must make is that the tool has not been put through our new web format web CMS so it will not look exactly like it looks now. It will look similar to our Burnwise pages.

The pages attached in Word will be the front door to this tool, at least page 1 is, and the other pages will open as links on page 1. My database guru is off today so I don't have the link and password for you and I am off Monday so Tuesday I will get that to you. In the meantime, I please review these pages and comment.

Gary Blais
The BurnWise Team
Office of Air Quality Planning & Standards
U.S. Environmental Protection Agency
RTP, NC 27709
919-541-3223



Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>
And on the Web at: www.epa.gov/burnwise

EPA CERTIFIED WOOD HEATER DATABASE

This database contains the manufacturer's name, model name, appliance type, and performance information (emission rate, heat output, efficiency, carbon monoxide among other records) for residential wood heaters approved by the Environmental Protection Agency for sale in the United States.

Formatted: Font: Complex Script Font: +Body CS (Arial), 11 pt, Not Bold

Room Heaters

Room heaters, as the name suggests are intended to heat only the room they are in. Room heaters include free standing wood stoves and pellet stoves, and fireplace inserts that burn either cordwood or wood pellets.



Central Heater

Central heaters are intended to heat an entire home, distributing heat from a residential hydronic heater or residential furnace unit (small or large), which can be located inside or outdoors via either water pipes in the case of hydronic heaters (aka, wood boilers) or air ducts in the case of forced-air furnaces.

Formatted: Font color: Red



EPA CERTIFIED WOOD HEATER DATABASE

Background

Residential wood combustion (RWC) emissions are a significant national air pollution problem and human health issue. RWC emissions occur in many neighborhoods across the country, including minority and low-income neighborhoods, and impact people in their homes. Nationally, residential wood combustion accounts for 44 percent of total stationary and mobile emissions of polycyclic organic matter (POM) – compounds present in the air as particles formed mainly from combustion. RWC POM accounts for nearly 25 percent of all area source air toxics cancer risks and 15 percent of noncancerous respiratory effects. RWC causes many counties in the United States to either exceed the U.S. Environmental Protection Agency's (EPA) health-based National Ambient Air Quality Standards (NAAQS) for fine particles or places them on the cusp of exceeding those standards.

RWC from residential wood heaters contributes significantly to particulate air pollution. Exposure to particulate air pollution can result in short-term health effects ranging from irritated eyes to asthma attacks; and long-term health risks such as an increased risk of cancer, reduced lung function, and chronic bronchitis.

To address RWC emissions and health concerns, and to comply with the Clean Air Act requirements under Section 111b and Section 114, the EPA revised its standards for new residential wood heaters on May 15, 2015 (Wood Heater New Source Performance Standards (NSPS)). Under the NSPS, the EPA certifies wood heaters that employ the latest technology and meet the particulate matter limits established by the Wood Heater NSPS. ~~The Wood Heater NSPS requires manufacturers to produce new wood heaters that are 50 percent more efficient at burning wood and 70 percent less polluting than wood heaters manufactured before 1990.~~ Wood heater model lines that comply with the Wood Heater NSPS are referred to as **EPA-certified wood heaters**.

Pursuant to the 2015 Wood Heater NSPS manufacturers may manufacture, offer for sale, or import a wood heater into the United States after applying for and obtaining an EPA Certificate of Compliance from the EPA. Similarly, retailers, wholesalers, importers, and distributors of heaters may offer for sale heaters that have an EPA permanent label affixed to it.

EPA CERTIFIED WOOD HEATER DATABASE

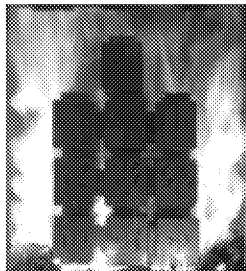
Regulatory Definitions

Adjustable Burn Rate Wood Heater: a wood heater that is equipped with or installed with a damper or other mechanism to allow the operator to vary burn rate conditions, regardless of whether it is internal or external to the appliance. This definition does not distinguish between heaters that are free-standing, built-in or fireplace inserts.

Catalytic Combustor: a device coated with a noble metal used in a wood heater to lower the temperature required for combustion.

Central Heater: a fuel-burning device designed to burn wood or wood pellet fuel that warms spaces other than the space where the device is located, by the distribution of air heated by the furnace through ducts or liquid heated in the device and distributed typically through pipes. Unless otherwise specified, these devices include, but are not limited to, residential forced-air furnaces (small and large) and residential hydronic heaters.

Crib wood is a specified configuration and quality of dimensional lumber and spacers, usually cut 2"x4" or 4"x4" lumber that is stapled together. This configuration was intended to improve the repeatability of wood burning emissions test methods.



Efficiency: the performance level of the wood heater as determined by the method included in CSA B415.1-10 Performance Testing of Solid-Fuel-Burning Heating Appliances.

Emission Rate Annual Avg (lb/mmBTU) - Particulate matter (PM2.5) emissions expressed in a weighted annual average of mass per unit of energy. This value is based on measurements made on the load side of the heat exchanger.

EPA CERTIFIED WOOD HEATER DATABASE

Pellet Stove (sometimes called pellet heater or pellet space heater): an enclosed, pellet or chip fuel-burning device capable of and intended for residential space heating or space heating and domestic water heating. Pellet stoves include a fuel storage hopper or bin and a fuel feed system. Pellet stoves include, but are not limited to:

- Free-standing pellet stoves--pellet stoves that are installed on legs or on a pedestal or other supporting base. These stoves generally are safety listed under ASTM E1509, UL-1482, ULC S627 or ULC-ORD C1482.
- Pellet stove fireplace inserts--pellet stoves intended to be installed in masonry fireplace cavities or in other enclosures. These stoves generally are safety listed under ASTM E1509, UL-1482, ULC-S628 or ULC-ORD C1482.
- Built-in pellet stoves--pellet stoves intended to be recessed into the wall. These stoves generally are safety listed under ASTM E1509, UL-127, ULC-S610 or ULC-ORD C1482.

Residential Forced-Air Furnace: Forced-Air Furnaces (FAFs) are divided into two categories – small and large – depending on their heat output. For each FAF category, the compliance dates and PM emission limits are as follows:

- On May 16, 2016 - Small forced-air furnaces (< 65,000 BTU per hour) must meet the following PM emission limit $\leq 0.93 \text{ lb/mmBTU}$ heat output (weighted average, using cord wood or pellets), See §60.5474(b)(4);
- On May 15, 2017 - Large forced-air furnaces ($\geq 65,000$ BTU per hour) must meet the following PM emission limit $\leq 0.93 \text{ lb/mmBTU}$ heat output (weighted average, using cord wood or pellets), See §60.5474(b)(5);
- On May 15, 2020 – Small and Large forced-air furnaces must meet the following PM emission limit $\leq 0.15 \text{ lb/mmBTU}$ heat output (individual burn rate, using cord wood or pellets).- See §60.5474(b)(6).

○ All applicable NSPS sections: <https://www.gpo.gov/fdsys/pkg/FR-2015-03-16/pdf/2015-03733.pdf>

Residential Hydronic Heater: a fuel burning device designed to burn wood or wood pellet fuel for the purpose of heating building space and/or water through the distribution, typically through pipes, of a fluid heated in the device, typically water or a water and antifreeze mixture. These devices must comply with the following compliance dates and particulate matter (PM) emission limits:

- On May 15, 2015 - PM emission limit $\leq 0.32 \text{ lb/mmBTU}$ heat output (weighted average) and a cap of 18 g/hr for each individual burn rate (using crib, pellets or cord wood). See §60.5474(b)(1);
- On May 15, 2020- PM emission limit $\leq 0.10 \text{ lb/mmBTU}$ heat output for each individual burn rate (using crib wood or pellets); or an optional emission limit of 0.15 lb/mmBTU heat output if tested with cord wood. See §60.5474(b)(1);

○ All applicable NSPS sections: <https://www.gpo.gov/fdsys/pkg/FR-2015-03-16/pdf/2015-03733.pdf>

EPA CERTIFIED WOOD HEATER DATABASE

Room Heater: an enclosed, wood burning-appliance capable of and intended for residential space heating or space heating and domestic water heating. These devices include, but are not limited to, adjustable burn rate wood heaters, single burn rate wood heaters, fireplace insert wood heaters and pellet stoves. Wood heaters may or may not include air ducts to deliver some portion of the heat produced to areas other than the space where the wood heater is located. Wood heaters include, but are not limited to:

- Free-standing wood heaters-- Wood heaters that are installed on legs, on a pedestal or suspended from the ceiling. These products generally are safety listed under UL-1482, UL-737 or ULC-S627.
- Fireplace insert wood heaters-- Wood heaters intended to be installed in masonry fireplace cavities or in other enclosures. These appliances generally are safety listed under UL-1482, UL-737 or ULC-S628.
- * Built-in wood heaters--Wood heaters that are intended to be recessed into the wall. These appliances generally are safety listed under UL-1482, UL-737, UL-127 or ULC-S610.
- * For all room heaters the PM emission limits are:
 - On May 15, 2015 - PM emission limit ≤ 4.5 grams/hour (weighted average) for each individual burn rate (using crib or cord wood). See §60.532(a)
 - On May 15, 2020 - PM emission limit ≤ 2.0 grams/hour (weighted average) on crib wood or an optional limit of 2.5 grams/hour if tested with cord wood. See §60.532(b)
 - ** All applicable NSPS sections: <https://www.gpo.gov/fdsys/pkg/FR-2015-03-16/pdf/2015-03733.pdf>

Formatted

Single Burn Rate Wood Heater: a wood heater that is not equipped with or installed with a burn control device to allow the operator to vary burn rate conditions. Burn rate control devices include stack dampers that control the outflow of flue gases from the heater to the chimney, whether built into the appliance, sold with it, or recommended for use with the heater by the manufacturer, retailer or installer; and air control slides, gates or any other type of mechanisms that control combustion air flow into the heater.

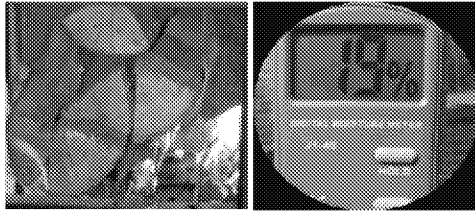
Wood Chip Fuel: wood chipped into small pieces that are uniform in size, shape, moisture, density and energy content.

Wood Pellet Fuel: refined and densified solid wood shaped into small pellets or briquettes that are uniform in size, shape, moisture, density and energy content.

EPA CERTIFIED WOOD HEATER DATABASE

Non-regulatory Terms

Cord Wood: firewood arranged in a stack 8 feet wide, 4 feet high and 2 feet deep. EPA recommends that cord wood be dried to a moisture level of no more than 20% to improve combustion and lower air pollutant emissions. A moisture meter is a simple and relatively inexpensive device available in many hardware stores that you can use to measure the moisture of your firewood.

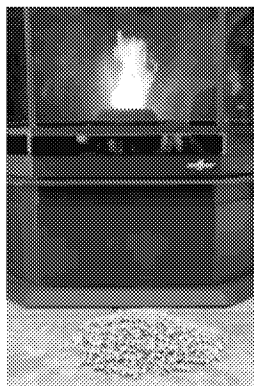


For more information about burning wood for heat safely and responsibly go to:

<https://www.epa.gov/burnwise/burn-wise-best-burn-practices>

Fireplace Insert: a type of heater/stove that is designed to fit inside the firebox of an existing wood-burning fireplace (Wood Heat Organization, 2010). EPA-certified fireplace inserts are essentially wood heaters/stoves without legs or pedestals. An insert is made of steel or cast iron and is typically installed in masonry fireplaces or traditional fireplaces in order to provide effective heating (Hearth, Patio, and Barbeque Association [HPBA], 2010b).

Wood Pellets: are usually made of wood from discarded wood products (sawdust, wood waste, etc) which is compressed into small pellets. Wood pellets burn more efficiently than cord wood because of their uniform dimensions, low moisture, density, and energy content.



EPA CERTIFIED WOOD HEATER DATABASE

Pop-up Definitions

Efficiency: the percentage of heat generated by a wood heater with a full load of fuel compared to the potential energy of that fuel.

Emission Rate Annual Avg (lb/mmBTU): the amount of particle air pollution emitted by a central heater in pounds per heat units, expressed in millions of BTU's (British thermal units).

Emission Rate Annual Avg (grams/hour): the amount of particle air pollution emitted by a room heater in grams of particle pollution per hour.

Residential Forced-Air Furnace: a central heater that uses wood (including cord wood, wood pellets or wood chips) as a fuel instead of oil or natural gas and operates the same way as any other central heater, distributing air heated by the furnace through ducts to other rooms in the home. For a more detailed definition, please refer to section 60.5473 of the Wood Heater NSPS.

Residential Hydronic Heater: a central heater that uses wood (including cord wood, wood pellets or wood chips) as a fuel instead of oil or natural gas. Hydronic heaters, as known as wood boilers, can be located indoors or outdoors distributing heat through pipes carrying water heated by the furnace to the home. Once inside the home heat can be distributed to the entire home through pipes to baseboard radiators or blown by a fan through ductwork. It's also possible to store some of the heated water for showering and other household uses in a tank. Some units are equipped with thermal storage which can respond to heating demand and reduce the need to restart the heater throughout the day, thereby reducing wood use and pollution emissions. For a more detailed definition, please refer to section 60.5473 of the Wood Heater NSPS.

Heat output (BTUs/hour): a measure of the amount of heat produced expressed in British Thermal Units per hour. The heat output provides a way to correctly size the wood heater you need for your home and a way to compare one heater to another.

Type: room heaters include freestanding wood stoves and fireplace inserts which use either cord wood or wood pellets for fuel. Central heaters include residential hydronic heaters (aka, wood boilers) and residential forced-air furnaces.

EPA CERTIFIED WOOD HEATER DATABASE

Subtype: any wood heater, regardless of fuel type, can be equipped with a catalyst which is a device that improves combustion of gases created by the fire thereby reducing pollution emissions.

Fuel Type: in most cases, wood heaters are designed to use one fuel type, either cord wood, wood pellets or wood chips and generally that is the fuel they were tested with and for which they were EPA-certified to use. Some wood heaters are sold as multi-fuel units which means fuels other than wood can be used in them but the fuel used to obtain the EPA certification must be clearly identified on the back of the unit. Manufacturers and retailers cannot sell multi-fuel heaters unless all fuels advertised have been tested even though the only fuel a heater can be certified for is cord wood, wood pellets, or wood chips. EPA cannot certify other fuels under the Wood heater NSPS but EPA will accept test reports for other fuels to gather test data in case other fuels are covered under the NSPS in the future. The user should not expect that the heater will achieve the EPA-certified emission rate if fuels other than wood are used.

CO: carbon monoxide (CO) is a colorless, odorless, and tasteless gas that is slightly less dense than air. CO is a product of wood combustion and is a colorless odorless gas that is a safety and health risk if breathed for too long in a confined space. Manufacturers are required to report the CO level attained during EPA-certification testing in grams per minute.

NSPS Compliance 2020: some wood heaters emit air pollution at a very low rate and therefore already meet the 2020 emission limit of 2.0 grams per hour (if tested with crib wood) or 2.5 grams per hour (if tested with cord wood) as required by the Wood heater NSPS for room heaters; or the 2020 emission limit of 0.10 lbs/mmBTU (for hydronic heaters if tested with crib wood) or 0.15lbs/mmBTU (if tested with cord wood) for residential hydronic heaters and residential forced-air-furnaces.

Message

From: Blais, Gary [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=27409AD3DF004224AA4370FF66AFEC8B-GBLAIS]
Sent: 4/19/2017 12:55:33 PM
To: jcrouch@hpba.org; lrector@nescaum.org; John Ackerly [jackerly@forgreenheat.org]
CC: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Sanchez, Rafael [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d26b2afd849e403fa022a1e14e5de7ff-Sanchez, Rafael]; Lischinsky, Robert [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5aa1867df1d64fe09bf558533c62ff82-RLischin]
Subject: Wood Heater Database news

Dear Partners,

As you know, EPA has been developing a wood heater database online tool for EPA-certified models. Before we finalize the tool and make it publicly available, the Agency would like to provide you an opportunity to review a draft version and provide us with feedback.

The database will be searchable and include all wood heaters currently certified under 40 CFR part 60, subpart AAA (room heaters) and subpart QQQQ (central heaters). The database will be divided by subpart. The purpose of the database is to inform the public, including potential consumers, about the emissions, efficiency, and other test data of EPA-certified wood heaters. The tool will have advance search functions that may be of interest to state and local governments, as well as NGOs working on residential wood combustion.

We anticipate being able to share the draft database with you by the end of April. If possible, we would appreciate comments by May 10, but let us know if you would like more time. We will provide a list of items we specifically want you to comment on, as well as "other items" that are harder for EPA to change, but we would consider updating if we released version 2 of this database. But any and all comments would be greatly appreciated!

Please let me know if you agree to be a reviewer. If so, we will provide a password protected link to the draft database, as well as log-in information and the list of items for you.

Regards,

Adam

Message

From: Rachel Feinstein [feinstein@hpba.org]
Sent: 1/29/2018 9:58:46 PM
To: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; John Crouch [crouch@hpba.org]
Subject: RE: CSR
Attachments: Residential Wood Heaters (012918).pdf

Adam,

FYI, see attached. We never heard from CRS about this report.

Rachel

**Rachel Feinstein**

Manager – Government Affairs
Hearth, Patio & Barbecue Association
1901 North Moore Street, Suite 600 | Arlington, VA 22209
Office: 703-522-0086 x 109 | **Mobile:** 703-828-4724
Visit us online today! | feinstein@hpba.org

From: Rachel Feinstein
Sent: Wednesday, January 24, 2018 5:33 PM
To: 'Baumgart-Getz, Adam' <Baumgart-Getz.Adam@epa.gov>; John Crouch <crouch@hpba.org>
Subject: RE: CSR

Great, thanks Adam!

Rachel

**Rachel Feinstein**

Manager – Government Affairs
Hearth, Patio & Barbecue Association
1901 North Moore Street, Suite 600 | Arlington, VA 22209
Office: 703-522-0086 x 109 | **Mobile:** 703-828-4724
Visit us online today! | feinstein@hpba.org

From: Baumgart-Getz, Adam [<mailto:Baumgart-Getz.Adam@epa.gov>]
Sent: Wednesday, January 24, 2018 5:32 PM
To: Rachel Feinstein <feinstein@hpba.org>; John Crouch <crouch@hpba.org>
Subject: CSR

John and Rachel-

Our front office decided they will coordinate with CSR and pass your information along to them.

Regards,

Adam

Adam Baumgart-Getz, PhD

U.S. Environmental Protection Agency
Group Leader
Innovative Programs and Outreach
Research Triangle Park, NC
Phone: (919) 541-0386

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>

**MEMORANDUM**

January 29, 2018

To: Senator Shelley Moore Capito
Attention: C. Travis Cone

From: Kate C. Shouse, Analyst in Environmental Policy, kshouse@crs.loc.gov, 7-1181

Subject: **Residential Wood Heaters: Federal and State Emission Standards**

Information in this memorandum may be used in other CRS products. Your confidentiality as a requester will be preserved in any case.

This memo responds to your request for information about state-level impacts from delaying the effective date of federal emission standards for new residential wood heaters and new residential hydronic heaters. In particular, you asked us to identify states that have promulgated state regulations referencing the federal emission standards for new residential wood heaters and new residential hydronic heaters, which are codified at 40 CFR part 60, subpart AAA, and 40 CFR part 60, subpart QQQQ, respectively.

The precise effect of delaying the 2020 “Step 2” effective date in federal standards is unclear due to questions about whether local or state standards would essentially negate a delay to the effective date of the federal standards. According to EPA, two states—New Hampshire and Vermont—have taken delegation for the current federal standards at 40 CFR part 60, subparts AAA and QQQQ. While the remaining states have not taken delegation, some have enacted state regulations for these devices. Some state regulations incorporate the federal standards by reference—e.g., referencing 40 CFR part 60, subpart AAA—but at least one state wrote the Step 2 deadline into state code (see Colorado, 5 CCR 1001-6 No. 4, *Sale and Installation of Wood-Burning Appliances and use of certain wood-burning appliances during high pollution days*.¹) In the event of changes to the federal standards, the applicability of these state regulations would need to be evaluated on a case-by-case basis.

In addition, emission standards for new residential wood heaters or new residential hydronic heaters may have been incorporated into county-level ordinances or State Implementation Plans.² For example, local governments in Minnesota have adopted ordinances addressing outdoor hydronic heaters, which are also known as outdoor wood boilers or outdoor wood furnaces.³ Another example is Alaska, which recently

¹ See https://www.colorado.gov/pacific/sites/default/files/5-CCR-1001-6_1.pdf

² State Implementation Plan is a collection of regulations and documents used by a state, territory, or local air district to reduce air pollution in areas that do not meet the National Ambient Air Quality Standards. See the Clean Air Act for detailed requirements, including 42 U.S.C. 7407 and 7410.

³ See <https://www.pca.state.mn.us/air/wood-smoke>

amended its State Implementation Plan to address requirements for wood-fired heating devices located in a nonattainment area.⁴

According to the experts we interviewed, no one systematically tracks the status of state and local regulations for residential wood burning heaters or residential hydronic heaters.⁵ The lack of comprehensive information on the status of state and local emission standards for these devices makes it difficult to determine whether manufacturers would be subject to more stringent standards in some states or local jurisdictions in the event of a delay to effective date of the federal standards.

In sum, legal questions about the interactions of local, state, and federal regulations as well as uncertainty about future stakeholder actions makes it difficult to predict the impact of potential changes to the Step 2 effective date. Given that some states have already promulgated state regulations and that such standards can be more stringent than the federal standards, delays to the effective date of the federal standards could result in a patchwork of emission standards for new residential wood heaters and new residential hydronic heaters. CRS cannot predict how a state might interpret its own regulations, and the extent to which the state regulations may be affected by any change in federal rules. CRS also cannot predict how a state may respond to any changes in federal rules, either through interpretation or by subsequently revising its own rules, guidance or procedures. Finally, changes in federal or state rules may or may not result in a change to an industry with potentially long-lead times for re-tooling for manufacturing and marketing and distribution.

CRS researched your question by interviewing U.S. EPA's air program staff, state officials, and a wood heater regulatory expert. CRS also conducted a database search to identify state regulations for new residential wood heaters and new residential hydronic heaters. Based on this search, CRS identified 11 states with wood heater regulations referencing the federal emission standards for new residential wood heaters (see Appendix A for list of the state regulations and Appendix B for the detailed search methodology). The list in Appendix A provides examples of state references to federal wood heater regulations but it is not exhaustive.

I hope this information is helpful. Please feel free to contact me if you have additional questions.

⁴ Stakeholders recommended that Alaska address the Step 2 New Source Performance Standard deadline in state code; Alaska responded that it would address that recommendation in a future rulemaking. See Alaska Department of Conservation, *Responsiveness Summary, 2017 Fairbanks PM2.5 Regulations*, November 3, 2017, pp. 4-5, <http://dec.alaska.gov/air/anpms/communities/fbks-pm2-5-proposed-regs-2017>.

⁵ CRS interviewed U.S. EPA's air program staff, state officials, and a wood heater regulatory expert.

Appendix A.

State wood heater regulations referencing 40 CFR part 60

- Colorado, 5 CCR 1001-6 No. 4, Sale and Installation of Wood-Burning Appliances and use of certain wood-burning appliances during high pollution days.⁶
- Section II (A): “No person shall advertise to sell, offer to sell, sell, or install a new wood-burning stove in Colorado unless it has been tested, certified, and labeled for emission performance in accordance with applicable criteria and procedures specified in 40 CFR Part 60, Subpart AAA and meets the following emission standards.
 1. On or after July 1, 1988, no person shall advertise to sell, offer to sell, sell, or install a new woodburning stove in Colorado unless it meets the emission standards set forth in 40 CFR Part 60, Section 60.532(b)(1) or (2) (1988).
 2. On or after May 15, 2015, no person shall advertise to sell, offer to sell, sell, or install a new woodburning stove in Colorado unless it meets the emission standards set forth in 40 CFR Part 60, Section 60.532(a) (2015).
 3. (State Only) On or after May 15, 2020, no person shall advertise to sell, offer to sell, sell, or install a new wood-burning stove in Colorado unless it meets the emission standards set forth in 40 CFR Part 60, Section 60.532(b) or (c) (2015).⁷
- Georgia, Ga. Comp. R & Regs. r.391-3-1-.02 Section 8, “New Source Performance Standards”
 - Section (8)(a): “General Requirement. No person shall construct or operate any facility or source which fails to comply with the New Source Performance Standards contained in 40 Code of Federal Regulations (hereinafter, CFR), Part 60, as amended, including but not limited to (unless specifically excluded below), the subparts hereby adopted through incorporation by reference in paragraph (b) of this subsection.”
 - Section (8)(b)(86): “Standards of Performance for New Residential Wood Heaters: 40 CFR Part 60 Subpart AAA, as amended March 16, 2015, is hereby incorporated and adopted by reference.”

⁶ See https://www.colorado.gov/pacific/sites/default/files/5-CCR-1001-6_1.pdf

⁷ All of the quoted text in this bullet point is excerpted from Colorado Regulation 4. After EPA promulgated the 2015 NSPS at 40 CFR part 60, subpart AAA and subpart QQQQ, Colorado updated its state regulation. Specifically, Colorado updated Regulation 4 to retain a state emission standard of 4.1 g/hr for pellet stoves until the effective date of the NSPS AAA Step 2, i.e., 2020. (Colorado described its emission standard of 4.1 g/hr for pellet stoves as more stringent than the federal NSPS AAA Step 1 rate of 4.5 g/hr for catalytic and noncatalytic stoves). Colorado updated Regulation 4 to “require pellet stoves sold or installed after the compliance date of the NSPS AAA Step 2 emission standard meet the future, more stringent NSPS AAA 2020 emission standard.” Colorado included the phrase, “State Only,” in Regulation 4 to refer to the Step 2 emission standards, explaining that “[b]ecause the 2020 emission standards are not necessary for Colorado to demonstrate attainment with the [coarse particulate matter] or [carbon monoxide] [National Ambient Air Quality Standards], the Commission referenced the 2020 emission standards in Regulation 4 but specified the 2020 emission standards as a State Only requirement.” See page 12 at https://www.colorado.gov/pacific/sites/default/files/5-CCR-1001-6_1.pdf.

- Section (8)(b)(88): “Standards of Performance for New Residential Hydronic Heaters and Forced-Air Furnaces: 40 CFR Part 60 Subpart QQQQ, as promulgated March 16, 2015, is hereby incorporated and adopted by reference.”
- Maine, Code of Maine Regulations 06-096-143 (see Chapter 143, “New Source Performance Standards (NSPS)”) ⁸
 - Section 2.A.: “For purposes of this Chapter, the following portions of 40 CFR Part 60, as amended up to July 1, 2013, are incorporated by reference herein: . . . (56) Subpart AAA; Standards of Performance for New Residential Wood Heaters.”
- Massachusetts, 310 CMR 7.26(50)-(54), MassDEP Wood-Fired Boiler Regulation ⁹
 - 310 CMR 7.26(54)(d)(1), “Laboratory Accreditation Requirements – A laboratory shall be accredited: (a) by the U.S. Environmental Protection Agency (EPA) for testing wood-burning residential space heaters in accordance with 40 CFR Part 60, Subpart AAA.”
- Minnesota, Minnesota Administrative Rules, Section 7011.2950 ¹⁰
 - Section 7011.2960, Standards of Performance for New Residential Wood Heaters, “Code of Federal Regulations, title 40, part 60, subpart AAA, as amended, entitled “Standards of Performance for New Residential Wood Heaters,” is adopted and incorporated by reference, except that decisions made by the administrator under Code of Federal Regulations, title 40, sections 60.530(c), 60.531, 60.533, 60.534, 60.535, 60.536(i)(2), 60.537, 60.538(e), and 60.539, are not delegated to the commissioner and must be made by the administrator.”
 - In addition, the Minnesota Pollution Control Agency (MCPA) developed a model ordinance ¹¹ for local governments to use in addressing particulate emissions from outdoor wood boilers, also known as hydronic heaters. The model ordinance incorporates the federal standards by reference. MCPA stated that this “means that if a community adopts the model ordinances now, future changes at the federal level are automatically incorporated in the local code.”
- Missouri, 10 CSR 10-6.070, New Source Performance Standards ¹²
 - 10 CSR 10-6.070, Section (3): “General Provisions. The following New Source Performance Standards (NSPS) 40 CFR part 60 subparts adopted by reference in subsection (1)(A) of this rule are listed below by individual source operations or installations in these categories and subject to this rule as specified in the applicable

⁸ See <https://www1.maine.gov/sos/cec/rules/06/chaps06.htm>

⁹ See <https://www.mass.gov/files/documents/2016/08/vu/ohhregfl.pdf>

¹⁰ See <https://www.revisor.mn.gov/rules/?id=7011.2950>

¹¹ See <https://www.pca.state.mn.us/sites/default/files/aq1-62a.pdf>

¹² See <https://www.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c10-6a.pdf>

subpart: ... (AAA) Standards of Performance for New Residential Wood Heaters.”
[this list does not include Subpart QQQQ.]

- New Hampshire, Chapter 125-R: Outdoor Wood-Fired Hydronic Heaters¹³
 - Section 125-R:1, Definitions, “I. ‘Certified outdoor wood-fired hydronic heater’ or ‘certified OWHH’ means a residential OWHH certified by the United States Environmental Protection Agency to meet the emissions standards codified in 40 C.F.R. part 60, subpart QQQQ and labeled accordingly, or a commercial high-efficiency, low-emission OWHH qualified by the New York State Energy Research and Development Authority.”
- Oregon, Oregon Administrative Rules (OAR) Chapter 340, Division 262, Heat Smart Program for Residential Woodstoves and Other Solid Fuel Heating Devices
 - OAR 340-262-0450, Definitions: “(11) ‘Federal Regulations’ means 40 CFR, part 60 subpart AAA as in effect on July 1, 2010.”¹⁴
 - OAR 340-262-0500, Section (1), Certification of Solid Fuel Burning Devices for Sale As New, “By order, the department may certify solid fuel burning devices that have been certified by the United States Environmental Protection Agency as meeting EPA emission performance standards and certification labeling standards pursuant to: (a) 40 CFR part 60, subpart AAA, as in effect on July 1, 2010; or (b) Any equivalent or more stringent standard adopted by the United States Environmental Protection Agency subsequent to July 1, 2010.”¹⁵
- South Carolina, S.C. Code Regs 61-62.20, South Carolina Designated Facility Plan and New Source Performance Standards, “Title 40 CFR Part 60 Subparts Incorporated by Reference.”¹⁶
 - S.C. 61-62.60: “Subpart AAA—‘Standards of Performance for New Residential Wood Heaters’ The provisions of 40 CFR Part 60 Subpart AAA, as originally published in the Federal Register and as subsequently amended upon publication in the Federal Register as listed below, are incorporated by reference as if fully repeated herein. [Section continues to list Federal Register citations for 40 CFR Part 60, Subpart AAA, including the 2015 final rule (80 FR 13671; March 16, 2015).]”
 - S.C. 61-62.60: “Subpart QQQQ-- ‘Standards of Performance For New Residential Hydronic Heaters And Forced-Air Furnaces’ The provisions of 40 CFR Part 60

¹³ See <http://www.gencourt.state.nh.us/rsa/html/X/125-R/125-R-mrg.htm>

¹⁴ See https://secure.sos.state.or.us/oard/viewSingleRule.action;JSESSIONID_OARD=IKjl-pZz2PpDIu8a9dDM1S6iLFjB4X51FxtDHCqYQPuxNCQJqY5S!79857996?ruleVrsnRsn=76137

¹⁵ See https://secure.sos.state.or.us/oard/viewSingleRule.action;JSESSIONID_OARD=IKjl-pZz2PpDIu8a9dDM1S6iLFjB4X51FxtDHCqYQPuxNCQJqY5S!79857996?ruleVrsnRsn=76141

¹⁶ See http://www.scdhec.gov/Agency/docs/air-regs/r61-62_60.pdf

Subpart QQQQ, as originally published in the Federal Register as listed below, are incorporated by reference as if fully repeated herein. [Section then cites the final federal rule for 40 CFR Part 60, Subpart QQQQ, 80 FR 13671; March 16, 2015.]”

- Vermont, Vermont Air Pollution Control Regulations 5-204, “Wood Stoves and Central Heaters”¹⁷

- See entire section for references. Examples include:

Section 5-204(c)(1)(i), “Requirements for Purchasers, Installers, and Owners/Operators. On or after December 15, 2016 no person shall purchase an affected wood heater unless it has been certified by the EPA as meeting the applicable standards and requirements of 40 C.F.R. §60.532.” [40 CFR 60.532 is within 40 CFR Part 60, Subpart AAA.]

Section 5-204(c)(1)(ii), “Requirements for Purchasers, Installers, and Owners/Operators. On or after December 15, 2016 no person shall purchase a central heater unless it has been certified by the EPA as meeting the applicable standards and requirements under 40 C.F.R. §60.5474.” [40 CFR 60.5474 is within 40 CFR Part 60, Subpart QQQQ.]

- Wisconsin, Chapter NR 440, Standards of Performance for New Stationary Sources¹⁸
 - Wisconsin regulations reference 40 CFR part 60, subpart AAA “as last revised on Oct. 17, 2000” (See Section 440.02). Wisconsin, Section 440.642, New residential wood heaters, “(1) APPLICABILITY AND DESIGNATION OF AFFECTED FACILITY. (a) The affected facility to which the provisions of this section apply is each wood heater manufactured on or after July 1, 1988, or sold at retail on or after July 1, 1990. The provisions of this section do not apply to wood heaters constructed prior to July 1, 1988, that are or have been owned by a noncommercial owner for personal use.”

¹⁷ See

http://dec.vermont.gov/sites/dec/files/documents/AQCD%20Regulations%20FINAL%20misc%20amendments%20ADOPTED_clean.pdf

¹⁸ See http://docs.legis.wisconsin.gov/code/admin_code/nr/400/440.pdf

Appendix B.

Search methodology

CRS identified the state regulations in appendix A by searching the Administrative Codes and Regulations file in the Lexis Advance database and some additional Internet research. A CRS senior research librarian ran two queries of state and federal Administrative Codes and Regulations in the Lexis Advance database and searched for documents referencing “40 CFR part 60.” The first query required that the words “wood” and “heater” appear within 3 words of one another and the document also had to contain “40 CFR part 60”. The second required that documents contain the term “hydronic” and “40 CFR part 60”. In both queries, the results would capture the following variants for the CFR citation: “40 CFR part 60” or “40 C.F.R. part 60.”

CRS then reviewed the results and compiled a list of the state regulations that referenced either 40 CFR part 60, subpart AAA or subpart QQQQ. CRS eliminated documents that were not relevant, such as regulations that exempted residential wood heater units from air permit requirements (e.g., an “exemption from the obligation to obtain an operating permit” for “all sources and source categories that would be required to obtain a permit solely because they are subject to 40 CFR Part 60, Subpart AAA - Standards of Performance for New Residential Wood Heaters”). CRS added several states to the list based on additional research of states that have received at least partial delegation for 40 CFR part 60.

Message

From: Aldridge, Amanda [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=76646CA7DC41494C9435D78174CB6054-AALDRI02]
Sent: 9/22/2017 6:23:10 PM
To: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]
Subject: FW: HEC hearing has started
Attachments: HPBA-HHRG-115-IF18-20170913-SD028.pdf

This is what Jackie sent to us, which is from HPBA. This is actually signed by Rachel Feinstein. In it HPBA is asking for more time, not to repeal. This is what Frank essentially said too. I don't know why HPBA is asking for something different from us.

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: [@epaburnwise](https://www.facebook.com/EPABurnWise) on Twitter: <https://twitter.com/epaburnwise>

From: Ashley, Jackie
Sent: Monday, September 18, 2017 11:19 AM
To: Aldridge, Amanda <[PersonalMatters / Ex. 6](mailto:PersonalMatters@epa.gov)@epa.gov>
Cc: Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Cole, David <Cole.David@epa.gov>
Subject: RE: HEC hearing has started

The committee has posted a number of documents for the record on the hearing page site. One addresses the woodstoves bill. It's from HPBA and is attached.

<https://energycommerce.house.gov/hearings/big-relief-small-business-legislation-reducing-regulatory-burdens-small-manufacturers-job-creators/>

Jackie Ashley - US EPA - Office of Air Quality Planning and Standards - 919-541-7664 – ashley.jackie@epa.gov

From: Aldridge, Amanda
Sent: Wednesday, September 13, 2017 3:41 PM
To: Ashley, Jackie <Ashley.Jackie@epa.gov>
Cc: Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Cole, David <Cole.David@epa.gov>; Noonan, Jenny <Noonan.Jenny@epa.gov>
Subject: RE: HEC hearing has started

Thanks Jackie. Will do.

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>

From: Ashley, Jackie

Sent: Wednesday, September 13, 2017 3:38 PM

To: Aldridge, Amanda <Aldridge.Amanda@epa.gov>

Cc: Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Cole, David <Cole.David@epa.gov>; Noonan, Jenny <Noonan.Jenny@epa.gov>

Subject: RE: HEC hearing has started

Hi Amanda –

I spoke to OCIR about this, and they suggested we first check the website in 10 business days or so – when the record should officially “close”. So I think that’s the first thing to try. If the materials aren’t up by then (Sept 27) we can see pursue some other avenues.

Jackie Ashley - US EPA - Office of Air Quality Planning and Standards - 919-541-7664 – ashley.jackie@epa.gov

From: Aldridge, Amanda

Sent: Wednesday, September 13, 2017 3:20 PM

To: Ashley, Jackie <Ashley.Jackie@epa.gov>

Cc: Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Cole, David <Cole.David@epa.gov>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>

Subject: FW: HEC hearing has started

Jackie -

We want to look at the letters that were submitted for the record. I know HPBA submitted one, and so did several environmental and state organizations. We know the HPBA letter is about wood heaters, but don’t the content of the other letters. Will they be posted on the HEC hearing site? Or do we access them another way?

Thanks,

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>

From: Edwards, Chebryll

Sent: Wednesday, September 13, 2017 12:09 PM

To: Aldridge, Amanda <Aldridge.Amanda@epa.gov>; Bunte, Laura <Bunte.Laura@epa.gov>; Brockman, Larry <Brockman.Larry@epa.gov>; Cole, David <Cole.David@epa.gov>; Ashley, Jackie <Ashley.Jackie@epa.gov>

Cc: Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Jordan, Scott <Jordan.Scott@epa.gov>

Subject: RE: HEC hearing has started

I was on the whole time too....agreed on checking out the letters. C

Chebryll C. Edwards
Acting Director

Outreach & Information Division (C304-01)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, NC 27711
(919) 541-5428

From: Aldridge, Amanda
Sent: Wednesday, September 13, 2017 12:08 PM
To: Bunte, Laura <Bunte.Laura@epa.gov>; Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Brockman, Larry <Brockman.Larry@epa.gov>; Cole, David <Cole.David@epa.gov>; Ashley, Jackie <Ashley.Jackie@epa.gov>
Cc: Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Jordan, Scott <Jordan.Scott@epa.gov>
Subject: RE: HEC hearing has started

It's over. I think we should take a look at the additional letters that were just submitted for the record. My guess is a couple address wood heaters.

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>

From: Bunte, Laura
Sent: Wednesday, September 13, 2017 11:59 AM
To: Aldridge, Amanda <Aldridge.Amanda@epa.gov>; Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Brockman, Larry <Brockman.Larry@epa.gov>; Cole, David <Cole.David@epa.gov>
Subject: RE: HEC hearing has started

I had stopped listening at 11:30, but I'll turn it back on now.

From: Aldridge, Amanda
Sent: Wednesday, September 13, 2017 11:57 AM
To: Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Brockman, Larry <Brockman.Larry@epa.gov>; Cole, David <Cole.David@epa.gov>
Cc: Bunte, Laura <Bunte.Laura@epa.gov>
Subject: RE: HEC hearing has started

The hearing is still going on.

Personal Matters / Ex. 6

listening in case another Representative or Frank Moore says something significant?

Is anyone else still

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>

From: Edwards, Chebryll
Sent: Wednesday, September 13, 2017 10:04 AM

To: OAQPS OID <OAQPS_OID@epa.gov>

Subject: FW: HEC hearing has started

In case you are interested in listening. C

=====

Chebryll C. Edwards
Acting Director
Outreach & Information Division (C304-01)
Office of Air Quality Planning and Standards
U.S. EPA
Research Triangle Park, NC 27711
(919) 541-5428

From: Ashley, Jackie

Sent: Wednesday, September 13, 2017 10:03 AM

To: OAQPS SMT1 <OAQPS_SMT1@epa.gov>; OAQPS SMT2 <OAQPS_SMT2@epa.gov>

Cc: Keating, Martha <keating.martha@epa.gov>; Bunte, Laura <Bunte.Laura@epa.gov>; McLamb, Marguerite <McLamb.Marguerite@epa.gov>; Johnson, Yvonne W <Johnson.YvonneW@epa.gov>; Terry, Sara <Terry.Sara@epa.gov>

Subject: HEC hearing has started

The hearing has started and can be streamed at <https://energycommerce.house.gov/hearings/big-relief-small-business-legislation-reducing-regulatory-burdens-small-manufacturers-job-creators/>

Wednesday, Sept. 13. 10 a.m. HEC Subcommittee on Environment hearing titled “Big Relief for Small Business: Legislation Reducing Regulatory Burdens on Small Manufacturers and Other Job Creators.” Legislative hearing on HR 453, Relief from New Source Performance Standards Act [wood heaters]; HR 1917, Blocking Regulatory Interference from Closing Kiln (BRICK) Act [brick and clay]; HR 1119, Satisfying Energy Needs and Saving the Environment (SENSE) Act [CSAPR and MATS for waste coal]; and HR 350, Recognizing the Protection of Motorsports (RPM) Act.

Witnesses: **Dr. Rebecca Bascom**, Professor, Penn State College of Medicine; **Vincent Brisini**, Director of Environmental Affairs, Olympus Power, LLC; **Frank Moore**, President and Owner, Hardy Manufacturing Company, Inc.; **Steve Page**, President and General Manager, Sonoma Raceway; **Ryan Parker**, President and CEO, Endicott Clay Products; **Alexandra E. Teitz**, Principal, AT Strategies, LLC, on behalf of Sierra Club

Jackie Ashley - US EPA - Office of Air Quality Planning and Standards - 919-541-7664 – ashley.jackie@epa.gov



1901 NORTH MOORE STREET, SUITE 600
ARLINGTON, VA 22209 USA
P: (703) 522-0086 • F: (703) 522-0548
hpbamail@hpba.org • www.hpba.org

September 13, 2017

The Honorable Greg Walden
Chairman
Committee on Energy & Commerce
U.S. House of Representatives

The Honorable Frank Pallone
Ranking Member
Committee on Energy & Commerce
U.S. House of Representatives

The Honorable John Shimkus
Chairman
Committee on Energy & Commerce –
Subcommittee on the Environment
U.S. House of Representatives

The Honorable Paul Tonko
Ranking Member
Committee on Energy & Commerce –
Subcommittee on the Environment
U.S. House of Representatives

Dear Chairman Walden, Ranking Member Pallone, Chairman Shimkus, and Ranking Member Tonko:

As the trade association representing manufacturers, retailers, distributors, and servicers of wood and pellet stoves and inserts, hydronic heaters, and wood furnaces, in addition to other sectors of the hearth, patio, and barbecue industries, we are writing to express our ardent support for the Relief from New Source Performance Standards Act (H.R. 453) during today's hearing entitled "Big Relief for Small Business: Legislation Reducing Regulatory Burdens on Small Manufacturers and Other Job Creators."

HPBA and its members have been long-time champions of woodburning product innovation through more efficient and cleaner burning technology. Biomass, such as wood, is an important renewable home heating option. HPBA takes every opportunity to ensure the general public has a wide variety of woodburning appliances available.

The New Source Performance Standards (NSPS) rule for new residential wood and pellet stoves, hydronic heaters, and wood furnaces was finalized in 2015 and has two sets of standards. Manufacturers already have met the Step 1 standards. However to meet Step 2 standards, manufacturers must research and develop new technologies, test them for durability, send them to an EPA lab for testing and approval, and then finally have their products certified by the EPA. To have these products in stores by the current Step 2 May 2020 deadline, the typical business cycle necessitates at least three years, meaning manufacturers currently need to complete the full process by summer 2018. Manufacturers need to have products for Step 2 ready to be pitched to retailers for the 2019-2020 heating season. Retailers aren't going to purchase products that can't be sold in the next heating season since it can sometimes take five years to sell a wood heater.

H.R. 453 would extend the effective date of Step 2 of the EPA's NSPS by three years, from May 15, 2020 to May 15, 2023. Without this extension, at least 6,500 manufacturing jobs in mostly rural communities across the country are at risk. The Step 2 standard will make wood heaters more expensive and less affordable for middle class families looking for a reliable and inexpensive heating option. More people will hang onto older, non-EPA-certified products due to the increase in prices, which is not good for air quality.

With only five EPA-approved test labs, the industry faces a log jam getting products tested by EPA-approved labs. As the deadline gets closer, hundreds of appliances will need EPA testing and certification in a very short timeframe. There is not enough capacity to get through the process in time. Once a valid test by an approved lab is complete and a manufacturer receives a certificate of conformity, EPA must review the certification application, which can take more than 60 days if there are questions. The surge in products needing testing will further slow down the process to final EPA certification.

There is no sell-through provisions to allow Step 1 products already at retailers on May 2020 to be sold while EPA approves new Step 2 products. The effects would be devastating to small businesses. Many companies, both large and small, already are laying off workers to divert capital necessary to fund the expensive research and development costs. With research and development costs ranging from \$200,000 to \$500,000 per product (plus an additional \$20,000 fee per official laboratory test), companies are working to raise the capital needed to meet the new regulations with small companies being hit the hardest. For large companies that may have as many as 30 products, this investment could be more than \$10 million.

Rural communities would be particularly hard hit. Many impacted businesses developed in rural communities to meet home heating and business needs. If small businesses close, those communities will lose jobs. In addition, rural communities are primary users of woodburning appliances. They will be left with fewer choices and higher prices. A rule that does not afford manufacturers enough time to meet the Step 2 requirements may actually slow the very air quality improvements it intended to bring about. This is because, as products become more expensive or are not being put into commerce, consumers will hold onto their older, higher-emitting appliances.

An extension not only provides manufacturers with equal opportunity and necessary access to testing labs, but also would ensure stability in the retailer market, an important staple to healthy local economies. Additional time will allow for the continued development of more efficient and reliable woodburning hydronic heaters, wood and pellet stoves, and wood furnaces for American homes.

Thank you for your consideration of H.R. 453 and the testimony of Frank Moore, President and owner of Hardy Manufacturing. We look forward to further discussion and hope to be a resource to you and your staff in the future.

Sincerely,

A handwritten signature in cursive script that reads "Rachel Feinstein".

Rachel Feinstein
Manager – Government Affairs
Hearth, Patio & Barbecue Association

Message

From: John Crouch [crouch@hpba.org]
Sent: 11/9/2017 5:07:23 PM
To: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]
Subject: FW: NSPS and non-NSPS products at HPBEXPO

Adam,

This will have serious consequences, and might even truncate the Vesta Awards, or at least the solid fuel portion of those awards.

I think all of USEPA needs to be certain that they stand behind this email, before things go much further.

I'm not certain that any EPA, or state or local folks will want to be touring EXPO if these are the terms of reference, as everyone from Government will be understood to be a potential threat.

I initiated this discussion, simply to give HPBA something to tell importers, who may not understand our rules.

This response is not what I expected, at all.

John Crouch

Director of Public Affairs

Hearth, Patio & Barbecue Association

Sacramento, California Office

916.536.2390

916.717.1209 Mobile

Main office, Arlington, VA

[Visit us online today!](#)



EXHIBITION: MARCH 8-10, 2018

EDUCATION: MARCH 7-9, 2018

MUSIC CITY CENTER | NASHVILLE, TN

[SAVE THE DATE](#) | [VISIT US ONLINE](#)

From: Sanchez, Rafael [mailto:Sanchez.Rafael@epa.gov]
Sent: Wednesday, November 08, 2017 3:22 PM
To: John Crouch
Cc: Amy Jackson; Baumgart-Getz, Adam; Aldridge, Amanda; Lischinsky, Robert
Subject: RE: NSPS and non-NSPS products at HPBEXPO

John,

Thank you for contacting the U.S. Environmental Protection Agency (EPA). The following guidance will assist exhibitors who may want to show products that are not certified.

Pursuant to the Standards for Performance for New Residential Wood Heaters (40 CFR part 60, subpart AAA) ("Wood Heater Rule"), no manufacturer or retailer may "advertise for sale, offer for sale, sell or operate" an

affected residential wood heater that is not tested and certified as meeting the emissions standards set out in the Rule. 40 CFR 60.538 (80 FR 13672, 13713 (March 16, 2015)). Affected residential wood heaters currently include, but are not limited to, adjustable burn rate stoves, catalytic adjustable burn rate stoves; hybrid adjustable burn rate stoves; single burn rate stoves; and pellet stoves.

The EPA views the phrase "advertise for sale" as provided in the Wood Heater Rule to have broad scope and applicability, and that phrase includes communication that may have the effect of creating interest in potential consumers to purchase a wood heater.

Please be aware that all oral and written communication concerning a wood stove in any format (e.g., via Internet, brochures, fact sheets) must clearly and expressly inform potential consumers that the heater is not currently available for sale in the United States because the heater does not have EPA certification. Such communication also must clearly state that the heater will not be available to purchase and will not be sold and distributed to consumers in the United States until and if such EPA certification is received. Any statement to potential consumers that fails to alert them to a wood stove not currently being EPA certified and therefore not available for sale and purchase will likely constitute a violation of the Wood Heater Rule because it would "advertise for sale" the uncertified wood stove. Furthermore, prior to receiving EPA certification, any statement which indicates a definitive time frame by when the heater would receive such certification and/or would be available for sale/distribution may "advertise for sale" in contradiction of the Rule.

Please feel free to contact me if you have any further questions.

Rafael Sanchez, Ph.D.
Wood Heater Program Lead
Air Branch
Monitoring, Assistance, and Media Programs Division
Office of Compliance
U.S. Environmental Protection Agency (EPA)
Room 7149-D
1200 Pennsylvania Ave., NW
MS:2227A
Washington, DC 20460
202-564-7028
202-564-0050 fax

Please make a note of the new inbox for wood heater certification requests:
WoodHeaterReports@epa.gov

If you have a wood heater question, please visit the USEPA Wood Heater Compliance Monitoring Program website at <http://www2.epa.gov/compliance/wood-heater-compliance-monitoring-program>. On that web page, you will find information about the EPA wood heater compliance program including the List of EPA Certified Wood Heaters.

This message may contain sensitive and/or privileged information. If you believe you have received this e-mail in error, please notify me and delete the e-mail immediately.

From: John Crouch [<mailto:crouch@hpba.org>]
Sent: Friday, October 27, 2017 9:08 PM
To: Sanchez, Rafael <Sanchez.Rafael@epa.gov>
Cc: John Crouch <crouch@hpba.org>; Amy Jackson <amyjackson@hpba.org>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Aldridge, Amanda <Aldridge.Amanda@epa.gov>; Lischinsky, Robert <Lischinsky.Robert@epa.gov>
Subject: Re: NSPS and non-NSPS products at HPBEXPO

Thank you
John Crouch

Sent from my Verizon Wireless 4G LTE DROID

"Sanchez, Rafael" <Sanchez.Rafael@epa.gov> wrote:

Hi John,

This is to let you know that we are working on a response to your inquiry. Hopefully, I can get something to you next week. Have a good weekend.

Rafael Sanchez, Ph.D.
Wood Heater Program Lead
Air Branch
Monitoring, Assistance, and Media Programs Division
Office of Compliance
U.S. Environmental Protection Agency (EPA)
Room 7149-D
1200 Pennsylvania Ave., NW
MS:2227A
Washington, DC 20460
202-564-7028
202-564-0050 fax

Please make a note of the new inbox for wood heater certification requests:
WoodHeaterReports@epa.gov

If you have a wood heater question, please visit the USEPA Wood Heater Compliance Monitoring Program website at <http://www2.epa.gov/compliance/wood-heater-compliance-monitoring-program>. On that web page, you will find information about the EPA wood heater compliance program including the List of EPA Certified Wood Heaters.

This message may contain sensitive and/or privileged information. If you believe you have received this e-mail in error, please notify me and delete the e-mail immediately.

From: Aldridge, Amanda
Sent: Tuesday, October 17, 2017 10:18 AM
To: John Crouch <crouch@hpba.org>; Sanchez, Rafael <Sanchez.Rafael@epa.gov>; Lischinsky, Robert <Lischinsky.Robert@epa.gov>
Cc: Amy Jackson <amyjackson@hpba.org>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>
Subject: RE: NSPS and non-NSPS products at HPBEXPO

Hi John and Amy – This is an OECA function and I have forwarded your email to them.

Thanks,

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>

From: John Crouch [<mailto:crouch@hpba.org>]
Sent: Monday, October 02, 2017 2:23 PM
To: Aldridge, Amanda <Aldridge.Amanda@epa.gov>
Cc: Amy Jackson <amyjackson@hpba.org>
Subject: NSPS and non-NSPS products at HPBEXPO

Hello Amanda,

It's that time of year again, Amy Jackson, our exhibits manager, is starting to hear from Exhibitors who may want to bring new and innovative products to our show, and may need guidance on how to label them.

This is also the time of year we hear from folks who have never sold products into our country before, and may also be unclear about what it means to 'offer for sale', as opposed to 'display a prototype'.

If a company has a question about a new product and how it might be covered by the NSPS, I think we should direct them to you. Wouldn't you agree?

We certainly don't want them to wait until the last minute, OR, turn up on the show without having explored this issue with you prior to EXPO, and HPBA's opinion doesn't really matter, it's only EPA's understanding that counts.

Thanks,

John Crouch
Director of Public Affairs
Hearth, Patio & Barbecue Association
Sacramento, California Office
916.536.2390
916.717.1209 Mobile
Main office, Arlington, VA
[Visit us online today!](#)



EXHIBITION: MARCH 8-10, 2018
EDUCATION: MARCH 7-9, 2018
MUSIC CITY CENTER | NASHVILLE, TN
[SAVE THE DATE](#) | [VISIT US ONLINE](#)

Message

From: Sanchez, Rafael [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D26B2AFD849E403FA022A1E14E5DE7FF-SANCHEZ, RAFAEL]
Sent: 11/8/2017 11:21:45 PM
To: John Crouch [crouch@hpba.org]
CC: Amy Jackson [amyjackson@hpba.org]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRIO2]; Lischinsky, Robert [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5aa1867df1d64fe09bf558533c62ff82-RLischin]
Subject: RE: NSPS and non-NSPS products at HPBEXPO

John,

Thank you for contacting the U.S. Environmental Protection Agency (EPA). The following guidance will assist exhibitors who may want to show products that are not certified.

Pursuant to the Standards for Performance for New Residential Wood Heaters (40 CFR part 60, subpart AAA) ("Wood Heater Rule"), no manufacturer or retailer may "advertise for sale, offer for sale, sell or operate" an affected residential wood heater that is not tested and certified as meeting the emissions standards set out in the Rule. 40 CFR 60.538 (80 FR 13672, 13713 (March 16, 2015)). Affected residential wood heaters currently include, but are not limited to, adjustable burn rate stoves, catalytic adjustable burn rate stoves; hybrid adjustable burn rate stoves; single burn rate stoves; and pellet stoves.

The EPA views the phrase "advertise for sale" as provided in the Wood Heater Rule to have broad scope and applicability, and that phrase includes communication that may have the effect of creating interest in potential consumers to purchase a wood heater.

Please be aware that all oral and written communication concerning a wood stove in any format (e.g., via Internet, brochures, fact sheets) must clearly and expressly inform potential consumers that the heater is not currently available for sale in the United States because the heater does not have EPA certification. Such communication also must clearly state that the heater will not be available to purchase and will not be sold and distributed to consumers in the United States until and if such EPA certification is received. Any statement to potential consumers that fails to alert them to a wood stove not currently being EPA certified and therefore not available for sale and purchase will likely constitute a violation of the Wood Heater Rule because it would "advertise for sale" the uncertified wood stove. Furthermore, prior to receiving EPA certification, any statement which indicates a definitive time frame by when the heater would receive such certification and/or would be available for sale/distribution may "advertise for sale" in contradiction of the Rule.

Please feel free to contact me if you have any further questions.

Rafael Sanchez, Ph.D.
Wood Heater Program Lead
Air Branch
Monitoring, Assistance, and Media Programs Division
Office of Compliance
U.S. Environmental Protection Agency (EPA)
Room 7149-D
1200 Pennsylvania Ave., NW
MS:2227A
Washington, DC 20460
202-564-7028

202-564-0050 fax

Please make a note of the new inbox for wood heater certification requests:
WoodHeaterReports@epa.gov

If you have a wood heater question, please visit the USEPA Wood Heater Compliance Monitoring Program website at <http://www2.epa.gov/compliance/wood-heater-compliance-monitoring-program>. On that web page, you will find information about the EPA wood heater compliance program including the List of EPA Certified Wood Heaters.

This message may contain sensitive and/or privileged information. If you believe you have received this e-mail in error, please notify me and delete the e-mail immediately.

From: John Crouch [mailto:crouch@hpba.org]
Sent: Friday, October 27, 2017 9:08 PM
To: Sanchez, Rafael <Sanchez.Rafael@epa.gov>
Cc: John Crouch <crouch@hpba.org>; Amy Jackson <amyjackson@hpba.org>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Aldridge, Amanda <Aldridge.Amanda@epa.gov>; Lischinsky, Robert <Lischinsky.Robert@epa.gov>
Subject: Re: NSPS and non-NSPS products at HPBEXPO

Thank you
John Crouch

Sent from my Verizon Wireless 4G LTE DROID

"Sanchez, Rafael" <Sanchez.Rafael@epa.gov> wrote:

Hi John,

This is to let you know that we are working on a response to your inquiry. Hopefully, I can get something to you next week. Have a good weekend.

Rafael Sanchez, Ph.D.
Wood Heater Program Lead
Air Branch
Monitoring, Assistance, and Media Programs Division
Office of Compliance
U.S. Environmental Protection Agency (EPA)
Room 7149-D
1200 Pennsylvania Ave., NW
MS:2227A
Washington, DC 20460
202-564-7028
202-564-0050 fax

Please make a note of the new inbox for wood heater certification requests:
WoodHeaterReports@epa.gov

If you have a wood heater question, please visit the USEPA Wood Heater Compliance Monitoring Program website at <http://www2.epa.gov/compliance/wood-heater-compliance-monitoring-program>. On that web page, you will find information about the EPA wood heater compliance program including the List of EPA Certified Wood Heaters.

This message may contain sensitive and/or privileged information. If you believe you have received this e-mail in error, please notify me and delete the e-mail immediately.

From: Aldridge, Amanda

Sent: Tuesday, October 17, 2017 10:18 AM

To: John Crouch <crouch@hpba.org>; Sanchez, Rafael <Sanchez.Rafael@epa.gov>; Lischinsky, Robert <Lischinsky.Robert@epa.gov>

Cc: Amy Jackson <amyjackson@hpba.org>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>

Subject: RE: NSPS and non-NSPS products at HPBEXPO

Hi John and Amy – This is an OECA function and I have forwarded your email to them.

Thanks,

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: [@epaburnwise](https://www.facebook.com/EPABurnWise) on Twitter: <https://twitter.com/epaburnwise>

From: John Crouch [<mailto:crouch@hpba.org>]

Sent: Monday, October 02, 2017 2:23 PM

To: Aldridge, Amanda <Aldridge.Amanda@epa.gov>

Cc: Amy Jackson <amyjackson@hpba.org>

Subject: NSPS and non-NSPS products at HPBEXPO

Hello Amanda,

It's that time of year again, Amy Jackson, our exhibits manager, is starting to hear from Exhibitors who may want to bring new and innovative products to our show, and may need guidance on how to label them.

This is also the time of year we hear from folks who have never sold products into our country before, and may also be unclear about what it means to 'offer for sale', as opposed to 'display a prototype'.

If a company has a question about a new product and how it might be covered by the NSPS, I think we should direct them to you. Wouldn't you agree?

We certainly don't want them to wait until the last minute, OR, turn up on the show without having explored this issue with you prior to EXPO, and HPBA's opinion doesn't really matter, it's only EPA's understanding that counts.

Thanks,

John Crouch
Director of Public Affairs
Hearth, Patio & Barbecue Association
Sacramento, California Office
916.536.2390
916.717.1209 Mobile
Main office, Arlington, VA
[Visit us online today!](#)



EXHIBITION: MARCH 8-10, 2018

EDUCATION: MARCH 7-9, 2018

MUSIC CITY CENTER | NASHVILLE, TN

[SAVE THE DATE](#) | [VISIT US ONLINE](#)

Message

From: John Crouch [crouch@hpba.org]
Sent: 2/7/2017 6:22:36 PM
To: Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]
CC: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Rachel Feinstein [feinstein@hpba.org]
Subject: RE: Compliance Question

Thanks Amanda!
John

From: Aldridge, Amanda [mailto:Aldridge.Amanda@epa.gov]
Sent: Tuesday, February 07, 2017 10:15 AM
To: John Crouch
Cc: Baumgart-Getz, Adam; Rachel Feinstein
Subject: RE: Compliance Question

Hi John and Rachel,

The temporary hangtag is no longer required by the 2015 NSPS. I sent a note to Rafael to correct it. And yes, a 2020 hangtag is allowed if all requirements are met.

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
[@epaburnwise](https://www.facebook.com/EPABurnWise) on Twitter: <https://twitter.com/epaburnwise>

From: John Crouch [mailto:crouch@hpba.org]
Sent: Tuesday, February 07, 2017 12:27 PM
To: Aldridge, Amanda <Aldridge.Amanda@epa.gov>
Cc: Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Rachel Feinstein <feinstein@hpba.org>
Subject: FW: Compliance Question

Amanda,
Can you please help Rachel and I with the question below?
Rachel's response to Jason reflects what I thought was the proper response, but Jason points us to OECA's website, and that implies that nothing has changed.
We're confused and hope you can help.
Thanks
John

From: Rachel Feinstein
Sent: Tuesday, February 07, 2017 8:49 AM
To: Jason Freeman
Cc: John Crouch
Subject: RE: Compliance Question

Hi Jason,

I also thought that the temporary hangtag was no longer required, but an option for any model meeting Step 2. John, see below and the temporary label on the page linked to. What do you think? If this page is incorrect, this could cause confusion for compliance officials in states.

Rachel

From: Jason Freeman [<mailto:jason@kumastoves.com>]
Sent: Tuesday, February 07, 2017 11:41 AM
To: Rachel Feinstein
Subject: Compliance Question

Rachel,

Thank you for your assistance, or for pointing me in the right direction.

Per EPA site here: <https://www.epa.gov/compliance/wood-heater-compliance-monitoring-program>

The temporary label is still required. I was under the impression that the "hang tag" had been eliminated and that a voluntary hang tag could be applied for those stoves meeting the 2020 standard.

Can you clarify?

Regards,
Jason Freeman

--

Kuma Stoves
888-714-5294 Ph
888-714-5862 F
jason@kumastoves.com

Message

From: Aldridge, Amanda [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=76646CA7DC41494C9435D78174CB6054-AALDRI02]
Sent: 2/7/2017 6:15:01 PM
To: John Crouch [crouch@hpba.org]
CC: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Rachel Feinstein [feinstein@hpba.org]
Subject: RE: Compliance Question

Hi John and Rachel,

The temporary hangtag is no longer required by the 2015 NSPS. I sent a note to Rafael to correct it. And yes, a 2020 hangtag is allowed if all requirements are met.

Amanda Aldridge
US EPA Burnwise
aldridge.amanda@epa.gov
Phone: 919.541-5268

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
[@epaburnwise](https://www.facebook.com/EPABurnWise) on Twitter: <https://twitter.com/epaburnwise>

From: John Crouch [mailto:crouch@hpba.org]
Sent: Tuesday, February 07, 2017 12:27 PM
To: Aldridge, Amanda <Aldridge.Amanda@epa.gov>
Cc: Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Rachel Feinstein <feinstein@hpba.org>
Subject: FW: Compliance Question

Amanda,
Can you please help Rachel and I with the question below?
Rachel's response to Jason reflects what I thought was the proper response, but Jason points us to OECA's website, and that implies that nothing has changed.
We're confused and hope you can help.
Thanks
John

From: Rachel Feinstein
Sent: Tuesday, February 07, 2017 8:49 AM
To: Jason Freeman
Cc: John Crouch
Subject: RE: Compliance Question

Hi Jason,

I also thought that the temporary hangtag was no longer required, but an option for any model meeting Step 2. John, see below and the temporary label on the page linked to. What do you think? If this page is incorrect, this could cause confusion for compliance officials in states.

Rachel

From: Jason Freeman [<mailto:jason@kumastoves.com>]
Sent: Tuesday, February 07, 2017 11:41 AM
To: Rachel Feinstein
Subject: Compliance Question

Rachel,

Thank you for your assistance, or for pointing me in the right direction.

Per EPA site here: <https://www.epa.gov/compliance/wood-heater-compliance-monitoring-program>

The temporary label is still required. I was under the impression that the "hang tag" had been eliminated and that a voluntary hang tag could be applied for those stoves meeting the 2020 standard.

Can you clarify?

Regards,
Jason Freeman

--

Kuma Stoves
888-714-5294 Ph
888-714-5862 F
jason@kumastoves.com

Message

From: Baumgart-Getz, Adam [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A7437FA04B43497C9C2A0C821E51FF56-BAUMGART-GETZ, ADAM]
Sent: 11/16/2017 2:09:08 PM
To: Jack Goldman [goldman@hpba.org]; Ryan Carroll [carroll@hpba.org]; David Chung [DChung@crowell.com]
CC: Jordan, Scott [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=844c5777fea243d7a7b880c54e2cd2a7-Jordan, Scott]
Subject: Confidential Settlement Discussion Points

All-

On our last call, (Thursday, November 9th), I mentioned that I had grouped HPBA's litigation issues into 8 categories. I classified the discussion points based on our previous meeting agendas. I welcome any input you may have on the following:

1. Woodstove Step 2 emission limit
2. Forced-air furnace Step 2 emission limit
3. Hydronic heater Step 2 emission limit
4. Audit testing
5. EPA review of test reports
6. Manufacturer posting of full non-CBI reports
7. Step 2 transition relief
8. Several technical issues related to appliance definitions, ancillary equipment, etc.

Regards,

Adam

Adam Baumgart-Getz, PhD

U.S. Environmental Protection Agency
Group Leader
Innovative Programs and Outreach
Research Triangle Park, NC
Phone: (919) 541-0386

Join us on Facebook: <https://www.facebook.com/EPABurnWise>
@epaburnwise on Twitter: <https://twitter.com/epaburnwise>

Message

From: Rachel Feinstein [feinstein@hpba.org]
Sent: 3/7/2017 9:36:08 PM
To: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]
Subject: HPBA Comments on Maryland Proposal to Incorporate Federal NSPS Requirements
Attachments: removed.txt; HPBA Comments on Proposed Amendments to COMAR 26.11.09.11_Control of Particulate Matter from Small Wood Boilers.pdf

Hi Adam,

As promised, attached are our initial, brief comments on Maryland's proposal.

Rachel



Rachel Feinstein | Manager - Government Affairs

Hearth, Patio & Barbecue Association

1901 North Moore Street, Suite 600

Arlington, VA 22209

OFFICE: 703-522-0086 x 109 | **MOBILE:** 703-828-4724

Visit us online today! | feinstein@hpba.org



Suite 600, 1901 North Moore Street
Arlington, VA 22209 USA
Phone: (703) 522-0086 • Fax: (703) 522-0548
Email: governmentaffairs@hpba.org
Web Site: www.hpba.org

February 15, 2017

Maryland Department of the Environment
1800 Washington Blvd, Ste 730
Baltimore, MD 21230

Re: Comments of the Hearth, Patio & Barbecue Association on Proposed Amendments to COMAR 26.11.09.11 - Control of Particulate Matter from Small Wood Boilers

The Hearth, Patio & Barbecue Association (HPBA) appreciates the opportunity to comment on the Maryland Department of the Environment's (MDE) request for comments on the proposed amendments to COMAR 26.11.09.11 - Control of Particulate Matter from Small Wood Boilers.

Based in Arlington, Virginia, HPBA is the principal national industry association representing manufacturers, retailers, distributors, representatives, service firms, and allied associates for all types of hearth, barbecue, and patio appliances, fuels, and accessories, including solid fuel-fired home heating appliances, including woodstoves, pellet stoves, hydronic heaters, and warm air furnaces. The 2500-member association provides professional member services and industry support in education, statistics, government relations, marketing, advertising, and consumer education.

HPBA partnered with the Environmental Protection Agency (EPA) in developing and implementing the voluntary program for hydronic heaters. The program is particularly noteworthy as it fostered the development of a new generation of emission-controlled models that EPA has acknowledged have reduced emissions approximately 90 percent from baseline, uncontrolled levels.¹

Our comments focus primarily on: (1) support for the proposed amendments; (2) support of MDE's history of recommending following manufacturers' guidelines and best practices for installation; (3) recommending that the state of Maryland dedicate funds to change out older non-EPA-certified hydronic heaters in residential settings; (4) providing clarification between the permanent label and temporary hangtag requirements; and (5) recommending that Maryland not incorporate EPA's Step 2 of this rule at this time.

I. Support for the Proposed Amendments

We support Maryland in its proposal to update the state's regulatory requirements for hydronic heaters to match those of the EPA at the federal level.² This eases the burden on manufacturers to obtain certificates of compliance from the state of Maryland, as manufacturers are now required to obtain such certificates from EPA under the federal rule.

¹ See "Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces, and New Residential Masonry Heaters, Proposed Rule," 79 Fed. Reg. 6330, 6336 (February 3, 2014).

² See "Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces, Final Rule," 80 Fed. Reg. 13672. (March 16, 2015).

We recommend that MDE clarify that the seasonal prohibition on using non-certified hydronic heaters only applies to appliances used for residential purposes. EPA's applicable regulations, emissions requirements, and test methods only apply to new residential hydronic heaters. We recommend that the following be added:

C.(5)(c) it is not being used in a residential setting and not subject to this rule.

II. Support for the Department in Recommending Use of Manufacturers' Installation Manual Guidance for Product Installation

We commend the MDE for not proposing to mandate statewide installation requirements for new residential hydronic heaters. By adopting the EPA's rule statewide, MDE adopts EPA's language requiring manufacturers to include in hydronic heater owners' manuals requirements for operation and installation. If operation or installation best practices are not followed by an operator, the warranty for their appliance would be voided.³

During MDE's stakeholder workshop on Monday, January 30, 2017, MDE staff stated that they did not intend to require statewide property setback distances because different counties and regions have varying geographical needs. HPBA supports this position.

III. Recommendation That the State of Maryland Dedicate Funds to Change Out Older, Non-EPA-Certified Hydronic Heaters in Residential Settings

We recommend that Maryland consider adding to its already-existing changeout program a provision that provides funds for changing out older, non-EPA-certified hydronic heaters being used in people's homes. One of the most impactful methods of cleaning up a community's air is to remove older units and replace them with cleaner burning EPA-certified appliances.⁴

IV. Clarification of Distinction Between the Permanent Label and Temporary Hangtag Requirements and Other Labeling Provisions

EPA requires all EPA-certified hydronic heaters to have a readily-visible permanent label. Temporary labels, also referred to as hangtags, are voluntary and may only be displayed on units that meet or exceed requirements that come into effect May 15, 2020. These temporary labels may only be displayed before May 15, 2020 and end after that date.⁵

HPBA recommends that MDE revise the proposed labeling provisions to conform them to EPA's regulations. Specifically, in proposed Section B(2)(a)(i), MDE should add language clarifying that "an easily removable façade can be used for aesthetic purposes."⁶ Additionally, MDE should modify proposed Section B(2)(a)(iv) by replacing the phrase "will remain legible for the lifetime of the unit" with the phrase "is likely to remain legible for the lifetime of the central heater."⁷

³ See 40 C.F.R. § 60.5474(g) ("A user must operate an outdoor residential hydronic heater, indoor residential hydronic heater, residential forced-air furnace or other affected central heater in a manner consistent with the owner's manual. The owner's manual must clearly specify that operation in a manner inconsistent with the owner's manual would void the warranty.")

⁴ See EPA's Burn Wise Program for the benefits of changeout programs, at epa.gov/burnwise.

⁵ See 80 Fed. Reg. 13672 at 13682.

⁶ See 40 C.F.R. § 60.5478(a)(3)(i).

⁷ See 40 C.F.R. § 60.5478(a)(3)(iv).

V. Recommendation that the Maryland Department of Environment Not Incorporate Step 2 of EPA's NSPS

We recommend that Step 2 of EPA's NSPS (effective May 15, 2020) should not be incorporated into state law at this time. With a lawsuit challenging many of the requirements outlined in Step 2,⁸ as well as proposed federal legislation that would extend the Step 2 effective date from May 15, 2020 to May 15, 2023,⁹ many aspects of Step 2 could change. HPBA's May 2, 2014 comments (*attached*) address many of the issues being addressed in the pending litigation. The lawsuit is expected to be resolved in late 2017 or early 2018, but the exact resolution and whether the final rule will remain in the same form are unknown at this time. For that reason, we make this recommendation.

HPBA appreciates the opportunity to provide input regarding the proposed amendments and looks forward to participating in further review of this proposal in the future.

Respectfully Submitted,



Rachel Feinstein
Manager - Government Affairs

Cc: Ryan Carroll, HPBA, Director – Government Affairs
John Crouch, HPBA, Director – Public Affairs
Jack Goldman, HPBA, President & CEO
David Chung, Crowell & Moring LLP, Counsel

Attachment: Comments of Hearth, Patio & Barbecue Association on EPA's Proposed Standards of Performance for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces, and New Residential Masonry Heaters (May 2, 2014)

⁸ *HPBA v. EPA*

⁹ *The Relief from New Source Performance Standards Act of 2017; 2017.*

Message

From: Rachel Feinstein [feinstein@hpba.org]
Sent: 6/5/2018 2:27:02 PM
To: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]
Subject: HPBA Shipment Numbers
Attachments: HPBA Response to Request for Information on EPA NSPS PRA May 31 2018.pdf

Hi Adam,

Attached is the memo we reviewed with wood and pellet stoves and inserts shipment numbers.

Rachel



1901 NORTH MOORE STREET, SUITE 600
 ARLINGTON, VA 22209 USA
 P: (703) 522-0086 • F: (703) 522-0548
 hpbamail@hpba.org • www.hpba.org

May 31, 2018

TO: Jennifer O'Neil; EPA Support Contractor; ERG, Inc.

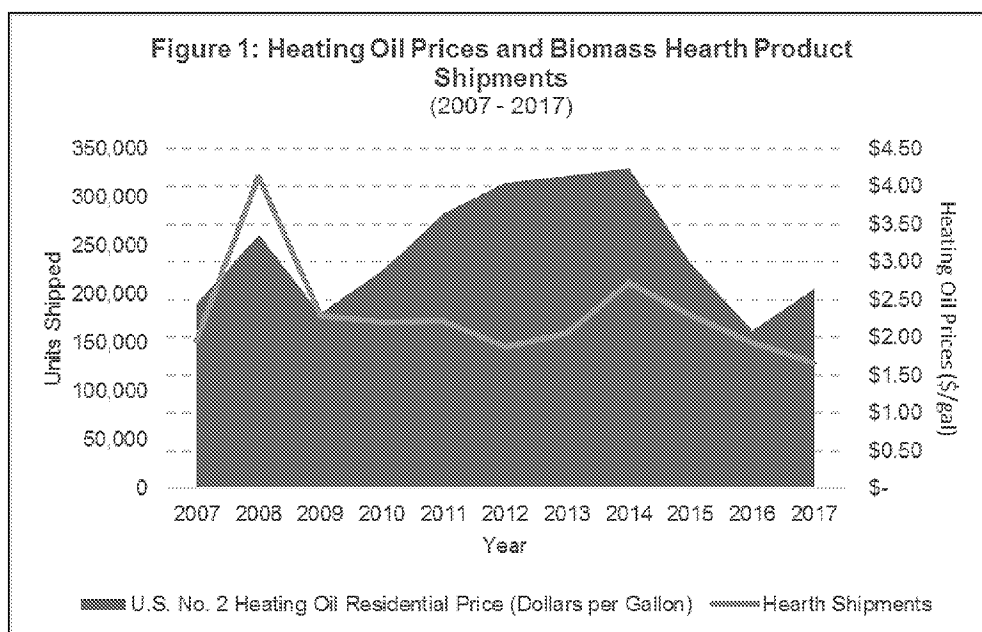
FROM: Rachel Feinstein; Senior Manager – Government Affairs;
 Hearth, Patio & Barbecue Association (HPBA)

Ref: NSPS for New Residential Wood Heaters (40 CFR Part 60, Subpart AAA) (Renewal), EPA ICR Number 1176.13, OMB Control Number 2060-0161, Expiration Date March 31, 2019

This memo is in response to a request for information contained in an email sent by Jennifer O'Neil on Thursday, May 17, 2018.

1. Response to request for feedback on items such as estimates of the burden hours and cost, number of respondents or model lines, and industry growth rates.

Given current trends, HPBA does not expect growth in the biomass hearth industry. At best, the industry will stabilize amidst fluctuations. Since the cost of fossil fuels impacts hearth products sales, as the cost of heating oil decreases, the size of the hearth industry and its sales also decrease. There are other variables that impact hearth product sales, but there is a general trend of an increase in hearth shipment sales as heating oil prices rise. Figure 1 displays hearth product shipments compared to heating oil prices between 2007 and 2017.¹ Table 1 provides the shipment numbers and heating oil prices illustrated by Figure 1.²



¹ U.S. Energy Information Administration. (2018). *U.S. No. 2 Heating Oil Residential Price (Dollars per Gallon)*. Accessed May 29, 2018. Retrieved from https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPD2F_PRS_NUS_DPG&f=M

² Hearth, Patio & Barbecue Association (HPBA). (2018). *U.S. Hearth Industry Shipments: Shipments within the US & from Canada into the US*.

Table 1: Heating Oil Prices and Biomass Hearth Product Shipments (2007 – 2017)		
Year	U.S. No. 2 Heating Oil Residential Price (Dollars per Gallon)*	Hearth Shipments
2007	2.447	153,419
2008	3.367	321,628
2009	2.322	178,767
2010	2.880	171,643
2011	3.640	172,275
2012	4.056	146,356
2013	4.145	159,854
2014	4.239	212,521
2015	2.984	178,903
2016	2.092	150,202
2017	2.644	129,217

*NOTE: Heating oil prices are from February of each year indicated in the first column.

The products included in “hearth shipments” are limited to wood and pellet freestanding stoves and inserts. As the price of heating oil increases, sales of these products also increase.

Regarding estimates of the burden hours and costs associated with the NSPS for New Residential Wood Heaters, there are more paperwork requirements for the 2015 rule than the 1988 rule, which implicates more hours (costs) of work for manufacturers.

The number of model lines will decrease as the standards become more stringent and/or as manufacturers decline to seek renewal of certifications for “deemed certified” model lines that they are no longer producing. Manufacturers are being selective in what models they are looking at moving forward. Regarding industry growth and sales rate, HPBA data shows a steady decline in shipments in recent years. Prior to 2014, hearth shipments fluctuated, with increases and decreases over the years. Since promulgation of the 2015 rule, we have seen a consistent decrease in shipments and anticipate an even bleaker outlook for industry as Step 2 of the NSPS approaches and takes effect.

HPBA collects data from its manufacturer members who make wood and pellet freestanding stoves and inserts. Figure 2 displays the shipments of these products over eleven years, from 2007 to 2017, within and to the United States. Table 2 provides the shipment numbers illustrated by Figure 2.³

³ HPBA. (2018). *U.S. Hearth Industry Shipments: Shipments within the US & from Canada into the US*.

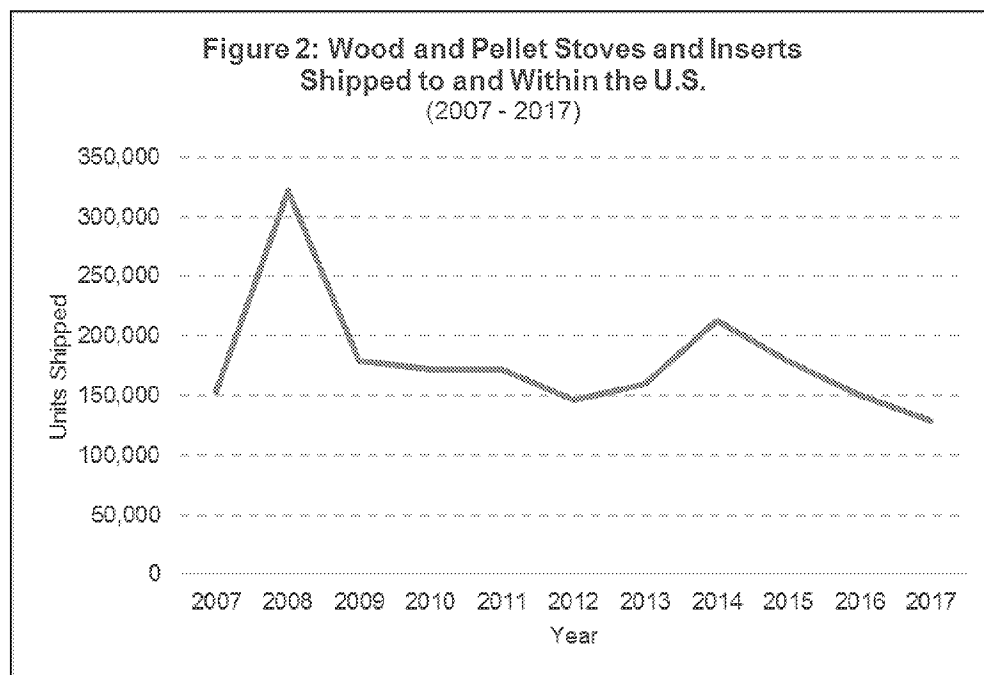


Table 2: Wood and Pellet Freestanding Stoves and Inserts Shipped Within and to the U.S. (2007-2017)	
Year	Wood and Pellet Freestanding Stoves and Inserts
2007	153,419
2008	321,628
2009	178,767
2010	171,643
2011	172,275
2012	146,356
2013	159,854
2014	212,521
2015	178,903
2016	150,202
2017	129,217

It should be noted that these numbers only represent units shipped, not actual units sold.

2. **Response to:** The prior ICR is based on the 2015 final rule amending 40 CFR 60, Subpart AAA (80 FR 13671, March 16, 2015), and lists 66 woodstove manufacturers with a total of 270 model lines, and 6 testing laboratories (including 4 test laboratories and 2 third-party certifiers) as the respondents for the rule. Do these numbers still seem reasonable?

According to EPA's list of EPA-approved test labs and third-party certifiers for the 2015 wood heater NSPS, there are eight (8) test laboratories (three of which are in Europe) and eight third-

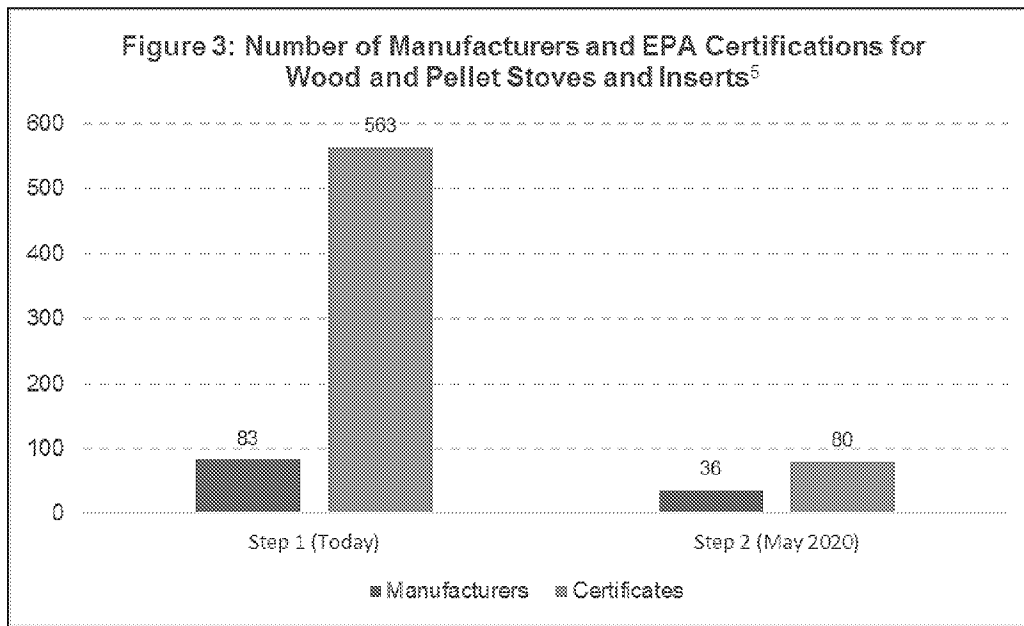
party certifiers (again, three of which are in Europe).⁴ There are a total of 12 EPA-approved test labs and third-party certifiers as there is some overlap with some labs being both EPA-approved as well as third-party certifiers.

Regarding number of manufacturers and number of certificates, we must first emphasize that the number of manufacturers and certificates currently listed on EPA's website cannot be used as a barometer for the health of the industry. The number of valid certificates tells us nothing about the number of products that are actually being manufactured and sold. Actual sales numbers for wood and pellet stoves and inserts are a better indicator of the health and stability of the industry. Having said that, it is unclear to us how many wood and pellet stoves and inserts and which models have been sold in the last two years since HPBA is unable to collect that data. Fortunately, every two years, EPA is required to collect from manufacturers sales reports for each model in each state. EPA has not yet made these sales numbers public, but they should have the reports for the vast majority of currently certified models and can verify how many have been sold. HPBA's shipment numbers are limited in that we collect data from HPBA members who opt-in to data collection. Not all HPBA members provide their shipment numbers, making EPA's sales numbers more reliable.

EPA's certified stoves list reflects that 83 manufacturers have a total of 563 stove certificates. Of those companies, 36 manufacturers collectively have 80 certificates for products that meet Step 2 of the NSPS, which is set to go into effect May 15, 2020. Of the remaining 483 certificates, 457 of them were "deemed certified," meaning they met the requirements of Step 1 before the rule went into effect May 15, 2015. It should be noted that although a certificate has been issued for deemed certified products, that does not necessarily mean deemed certified products are still being manufactured and sold today. As time goes on and we get closer to the May 2020 effective date, retailers will reduce their purchase orders for Step 1 products. We are already seeing this happen today – a full two years before the effective date of Step 2. If orders are decreased or cut off, this implies that manufacturing is also being cut off or decreased.

As evidenced by the existing list, on May 15, 2020, there will be decidedly fewer stoves and manufacturers. A summary of Step 1 and Step 2 manufacturers and certificates is displayed by Figure 3.

⁴ U.S. Environmental Protection Agency. (April 19, 2017). *EPA-approved Test Labs and Third-Party Certifiers for 2015 Wood Heater NSPS*. Accessed May 25, 2018. Retrieved from <https://www.epa.gov/residential-wood-heaters/epa-approved-test-labs-and-third-party-certifiers-2015-wood-heater-nsp>.



3. Response to: Can you provide whether is there any change in the expected growth or decline in the number of manufacturers, laboratories, or third-party certifiers?

We do not anticipate growth in the number of EPA-approved test labs, third-party certifiers, or manufacturers. We anticipate a decline in the number of manufacturers based on ongoing industry consolidation, regulatory impacts, and decreasing market size. The hearth industry is a mature business and, as such, the likelihood of an increase in the number of wood and pellet stove manufacturers is small.

Please let us know if you have any additional questions. I can be reached via email (feinstein@hpba.org) and phone at 703-522-0086 x109.

⁵ U.S. Environmental Protection Agency. (2018). *List of EPA Certified Wood Stoves*. Accessed May 31, 2018. Retrieved from <https://www.epa.gov/compliance/list-epa-certified-wood-stoves>

Message


From: Jill Mozier [mozier.jill@ecrweb.com]
Sent: 1/24/2017 4:26:46 PM
To: lisa rector [lrector@nescaum.org]; John Crouch [crouch@hpba.org]
CC: Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRIO2]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Graham Fitzsimons [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=user1ff2e955]
Subject: Draft Meeting Notes from January 12, 2017 Operation/Fueling WG Teleconference
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 1-12-2017.docx

Lisa and John,

Attached are the draft notes from the Operation & Fueling WG's January 12th meeting.

I'll be on this Thursday the 26th's call at noon.

Jill

Jill Mozier
mozier.jill@ecrweb.com
(919) 433-8334
EC/R Inc.
Chapel Hill, North Carolina
A Wholly Owned Subsidiary of


DRAFT January 24, 2017 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from January 12, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Marc Cohen** (Massachusetts), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), **Allen Carroll** (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- Lisa Rector and John Crouch discussed the option of having an O/F workgroup (WG) meeting at the HPBA Expo in Atlanta, GA (March 1-4, 2017).
- EPA's wood species testing by Mark Champion is continuing and is moving from burning crib wood to burning cordwood. EPA will post Mark's spreadsheet data after adding explanatory metadata to the spreadsheet to aid in data understanding/interpretation. Meanwhile, Lisa Rector has posted George Allen's real-time TEOM data to Basecamp and has provided graphs to the WG via e-mail. Any questions about the TEOM data should be directed to George Allen via e-mail, with Lisa Rector cc'd.
- The WG discussed the causes of emission spikes (as seen in the TEOM plots) including stirring/poking the fire, the natural release of organics from the wood, late pyrolysis from unburned wood catching and baking, how wood falls in the firebox, and [for lower fire burns] the lack of enough heat later in the burn to optimize the emission reduction system (whether thermal or catalytic). WG members from industry and lab explained that such spikes late in the low burn cycle can happen with any technology stove and are unpredictable.
- It was noted that going from a high fire to a medium fire is 2/3rds of the way to an integrated test run. As such, the ASTM method serves as a road map for a large portion of an integrated protocol. A fully integrated test run method would also go from medium to low fire. If a fully integrated test method was developed, the next goal might be designing the test to be achievable in one day, so that three days of testing would result in an N of 3 for each burn rate. Basing certification on an N of 3 instead of an N of 1 is important to regulators.

DRAFT January 24, 2016 --- Do not Cite or Distribute

- WG members discussed the advantages and challenges of shortening the test by re-defining the end of a category burn and developing a formula to link back to a full burn's Method 28 emissions. Advantages include shortening the test enough to get 3 data points (N of 3) for each burn rate, rather than the current single (N of 1) data point and developing a test that is more reproducible and reflective of actual stove operation. Challenges include the fact that efficiency calculations using CSA B415 assume a full burn down to 0 fuel load weight. Related to this, WG members opined that cutting-off the high fire test at 90% is not a problem, but shortening the low and medium fire burns is problematic and needs more research. It was also generally noted that, since stoves are designed to pass the certification test method, the implication of shortening (cutting-off) the test method on stove design needs to be understood, as the new test method must not negatively impact real-world performance.
- WG members discussed the possibility of defining a shortened end of the test for PM emissions, but define another end of test for efficiency calculations and/or calculating efficiency differently.
- Regarding efficiency, Bob Ferguson offered (when he has time) to run ASTM's and/or EPA's current stack gas data through the B415 algorithms and perform sensitivity analyses to determine the impact of shortening/cutting-off the test at various points.
- It was emphasized that in terms of determining compliance and a passing grade, any new values from a re-designed (shortened, integrated) test method would have to be correlated with the 4-burn steady state crib run values. The results of the new method would not have to meet [as-is] the NSPS's limit without the use of a formula to relate/translate the values.
- It was noted that a shortened test would require smaller fuel loads than used currently (e.g., in ASTM's draft cordwood method).
- It was noted that firebox size is another variable to consider when designing a new test method because larger fireboxes require longer tests. It was suggested that instead of time, the % of fuel weight consumed be the metric used to shorten the test – that is, that an integrated test run be based on fuel weight conditions. Nonetheless, it was agreed that the impact of different firebox sizes should be researched.
- The WG began discussing how to define burn categories (e.g., low burn defined as 30% of high burn) and it was decided to continue this aspect of the discussion on the next call in January. Bob Ferguson offered (when he has time) to review ASTM data regarding fixed burn rates versus burn rates defined by percentages.

To-Do List:

- WG members should e-mail Lisa Rector if attending the HPBA Expo and are interested in having a face-to-face O/F WG meeting. In the e-mail, indicate what days would work best for that meeting.
- John Crouch will send the HPBA Expo agenda to Lisa Rector, who will distribute to the States.

DRAFT January 24, 2016 --- Do not Cite or Distribute

Highlights from Meeting:

- Lisa Rector opened the meeting and noted that the following people were in attendance: John Crouch, Bob Lebens, Mark Champion, George Allen, Gregg Achman, Cindy Heil, John Barnes, John Steinart, Gaetan Piedalue, Randy Orr, Rick Curkeet, Robert Ferguson, John Wakefield, Ben Myron, Stef Johnson, Lisa Herschberger, Tom Morrissey and Adam Baumgart-Getz, as well as others who did not announce themselves.
- Lisa noted that the meeting's agenda includes reviewing the schedule for today's call, meeting updates/questions (regarding the IEA [European] Task Force meeting and the HPBA meeting), an update on Mark Champion's testing for EPA and a discussion of data analysis.
- Lisa noted that she and John Crouch had shifted the scheduled February and March calls and left April as it was. The Fueling and Operation Work Group (WG) should be getting an invite to IEA task force occurring in Graz, Austria. Lisa can be e-mailed questions while there, as she's attending. Lisa will send an agenda for that meeting to everyone and reminded the WG that it's a 6-hour difference from the East Coast and a 9-hour difference from the West Coast.
- Lisa asked how many people would be attending the HPBA Expo [in Atlanta, see <http://hpbexpo.com/>]. Lisa noted that this year there's no ASTM meeting before the Expo and wondered how many people from OF WG were attending the Expos, as it may make sense to have a face-to-face meeting there. WG members should please e-mail Lisa if attending the Expo and interested in having a face-to-face O/F meeting and indicate what days would work best. Lisa noted that John Crouch secured a meeting space on Tuesday that could be used; and on Wednesday, the group could meet in the evening or at EPA Region 4 offices.
- John Crouch clarified that the EPA regional office might be obtained for Wednesday, for the entire day, and then Thursday morning the group could tour outdoor wood burning. John further noted that on Friday morning there will be a short presentation aimed at retailers and what they need to know about options in cordwood testing. John asked the WG to please plan for several days if possible. John agreed to give the HPBA Expo agenda to Lisa this afternoon, so that Lisa can send it out to the states. John further clarified that last year in New Orleans and previously in Nashville the HPBA had meetings [prior to the start of the Expo]. But given that people are coming from different time zones and given that the ASTM method is essentially complete, nothing will be planned for Tuesday afternoon.
- Lisa noted that during the December call the O/F WG had gone through Bob Ferguson's ASTM review and Mark Champion's EPA species testing, which is ongoing. Lisa asked if there were any updates from Adam or Mark.
- Adam Baumgart-Getz noted that, regarding a quick overview, the work is continuing. [Mark Champion's testing is] close to being done with crib wood work and the cord wood species burning is starting. Adam further noted that EPA will share data with the WG, as it can be shared. In response to a question from Lisa regarding whether the old data sets were posted to Basecamp, Adam explained that the spreadsheets will be updated with metadata and that EPA

DRAFT January 24, 2016 --- Do not Cite or Distribute

hopes to get that metadata soon and then will post [the updated spreadsheets to Basecamp]. Adam explained that not all the columns in the current data spreadsheets are intuitive, so adding metadata will help with that. Lisa wondered if there would be misinterpretation of the data without metadata added. Adam replied that there could be, which is why EPA wants that metadata added before posting it to Basecamp.

- Lisa explained that real time TEOM data is on Basecamp, although [Mark Champion's] filter pull data is not yet posted. Lisa clarified that the study involves looking at TEOM data in addition to species [differences], to help determine how to define the end of test. Lisa suggested that the WG refer to the e-mail she sent with TEOM data in PDF, including a slide of [the TEOM's] correlation with the filter pull data. Lisa noted that there are also plots of different species by burn rate (although Lisa did not include the white pine data in those plots, as that data is too weird/different from the rest). Lisa explained that these are 15-second averages, glued to 2-minute running averages and they [especially Lisa and George Allen of NESCAUM] are looking for patterns from the TEOM data.
- Lisa noted that many have suggested that the test could end when 90% of the fuel is burned. The TEOM data shows that most of the emissions occur during the first 30 minutes of the burn.
- Lisa noted that it's important to think about an operational protocol to get at the data EPA needs to ensure compliance with the standard, but it's also important to move the test to an integrated test run. Lisa further noted that George plotted the different species information (with the exception of white pine) for high burns, medium burns and low burns.
- Rod Tinnemore asked if the peak at minute 160 is a reload situation. Lisa replied that it wasn't a re-load and that's why metadata is important. Rather, the fire may have been stirred/poked at this point. George Allen agreed that stirring/poking did indeed change the test. Lisa noted that she would like metadata added to the data to elucidate whether or not the two spikes on the low burn data are from stirring/poking. This would allow the impact of stirring to be shown. Lisa opined that it'd also be important to know the weight of the fuel charge at 110 minutes on the low burn, where the emissions are tailing off prior to stirring/poking.
- Ben Myron explained that organics come out of the wood in waves and are not evenly distributed over time. The wood alcohol peak comes, then there's a dip [in emissions], then a peak, then another dip, then finally the pyrolysis peak, followed by a dip and charcoal tail. Ben further explained that these peaks [in the TEOM data] could occur because some of the wood didn't get burned in the back of the firebox. This wood caught later but there was not enough heat in the firebox [at this later point] to fully burn, so these spikes occurred. George clarified that this is crib wood data. Ben noted that this can still happen with crib, not as often as with cordwood, due to the spacing; but [these peaks] could happen even with crib wood. Ben concluded that peaks don't surprise him and are well within the normal scatter of data that wood burners regularly see.

DRAFT January 24, 2016 --- Do not Cite or Distribute

- Lisa asked if her following understanding was correct: Towards the end of the burn, the emissions are not so much a reflection of the efficacy of the stove to control emissions, but are rather more indicative of how the end of the fuel charge is burning. Ben replied that it's a combination of both: If the stove can't handle the emissions [emission spikes might occur], but in addition, as more and more of the fuel is consumed, there is less fuel to sustain the emission reduction system, whether it's thermal or catalytic. Ben further explained that there may not be enough heat in the system to do the job, so a spike may occur. In this way, Ben explained that the later part of the burn can overwhelm the early part of the burn; a spike at the end can cause the loss of [an otherwise] compliant run and nothing can be done to control this.
- George explained that the spike occurring on the black Douglas fir curve at 200 minutes was caused by stirring/poking. Ben noted that if all the fuel was charcoal, then that spike wouldn't occur. Ben explained that pyrolysis (yellow flames) started and then that piece baked out and the firebox went back to charcoal. Mark Champion clarified that only 2 early burns were poked/stirred on Douglas fir. After that, the test end criteria were developed and poking was no longer required. Mark further clarified that these spikes are possibly caused by the 4x4's collapsing. The rise in CO₂, the drop in air-to-fuel ratio and the rise in burn rate indicate a rise in wood ignition and this was probably the 4x4s falling. Mark noted that there's real time stack gas analysis; so these spikes could be explained with the data.
- Lisa noted that the stove being used [in Mark Champion's EPA testing] is a pre-NSPS stove. Lisa asked how often unburned wood is left at the end of a compliance test using an NSPS-certified stove – that is, is it common or rare to have wood left in an EPA-certified stove? Lisa also asked if this issue is more common with certain burn rates, like lower and middle burn rates, or with all types of burn rates. Ben replied that any stove would be more prone to have this on the lower burn rates, because the stove temperature is low. On the high burn rate, Ben explained that there's a high enough temperature for the organics to come out of the wood. Regarding how often wood is left unburned at the end of a compliance test for an NSPS-certified stove, Ben notes this was a more difficult question to answer.
- Bob Ferguson noted that [labs and industry] call that a "chunky end". Bob noted that sometimes a 4x4 end remains and this would be a fair amount of the leftover weight, compared to ash and charcoal. So, you do see chunky leftover pieces, according to Bob. Ben agreed, but noted that there's not a stove out there that that couldn't happen to – this happens to all stoves. Bob agreed that spiking is not predictable at all and could happen on any stove. Regarding the pre-NSPS Vigilant stove in particular, Bob was somewhat familiar with it and noted that it can leave wood on the left end versus the right end and is known for that tendency.
- Lisa noted that she had something for the regulatory people to consider – that is, that burning down to 0 doesn't necessarily mean burning down to no fuel, so when thinking of a new test protocol to accurately represent stove and real world burns, consider whether it is important to go to 0. EPA may need to backtrack to the emission standard, but for a new test method, the goal is to characterize the performance of the stove, not how the burning wood falls within the firebox (for example). Looking at high and low burns hopefully allows for a way to end the test

DRAFT January 24, 2016 --- Do not Cite or Distribute

earlier and develop a formula to link back to a full burn's emissions. Lisa noted that this is important since the standard uses a g/hr metric – that is, time matters. Lisa noted that the WG needs to think about a definition for the end of a category burn, and develop a formula to get to 0 weight, so that the result is more reproducible and reflective of stove operation than a 0-weight end might be.

- Rick Curkeet reminded everyone that this test is being used to determine efficiency too, and the input is determined by the higher heating value of raw wood that's assumed to be fully burned in the test. Rick explained that the WG must consider this in deciding to cut the test off early. Rick noted that the efficiency determination assumes the stove burns back to starting conditions. Bob Ferguson agreed, noting there would be a difference in cutting test off before the charcoal phase, which may occur long before 90%. Bob noted that cutting off the test before all the volatiles are consumed could account for PM emissions, but looking at only parts of the burn cycle may increase the air band by quite a bit. Bob explained that the weighted average is based on the rate of fuel consumption and other parts of the algorithms. Bob concluded that it might be tricky if the test is cut off too soon.
- Ben Myron noted that the stove design itself is another aspect. For Method 28, all the test fuel must be burned. So, the stove must be designed to burn all the fuel. If the test is cut short, then the design will focus on [the new] test and that may or may not be a good thing for real-world performance. Ben emphasized that the WG needs to consider that implication. Lisa asked Ben what kind of test he would design, if he were to design a test to better reflect how the stove behaves in the real world. Would the test look like the ASTM test? Ben replied that he doesn't have a problem with cutting high burn at 90%, but the medium and low burns ought to go all the way to the end of the fuel load. Ben explained that, for stoves with asymmetrical air flow, if the test is cut off when the burning starts to release organics, that will be missed in the test results. Ben noted that one wouldn't want to cut that off. This happens in asymmetrical stove designs and the data is skewed from what the stove will do in the real world. It was suggested that the medium and low burns be run all the way to the end, until there is enough data to confirm that the test can be shortened.
- Lisa agreed that any changes [to the test method] shouldn't be made arbitrarily. These are research ideas. Lisa noted that she keeps circling back to an integrated test run – for example, going to a medium fire run after the high fire run is 2/3rd the way to an integrated run. Lisa wondered however how to go from a medium fire run to a low fire run. Lisa pointed out that if that third piece can be achieved, the goal then becomes how to achieve one test in one day and then repeat that test 3 times, because one data point at one burn rate is not enough. Lisa opined that it would be better to run that test 3 times. If the test doesn't go well at first, then there are 2 more days of testing.
- Lisa noted that an N of 3 instead of an N of 1 is important especially to regulatory people. Lisa asked if there is interest in heading in the direction of an integrated run. Ben Myron replied that he is willing to talk about [an integrated run], but the WG needs to be aware of the pitfalls. Lisa Herschberger noted that an N of 3 is much more valuable than an N of 1. She understands that

DRAFT January 24, 2016 --- Do not Cite or Distribute

there may be a problem with efficiency. Lisa Herschberger further noted that a test run of 2 hours may be sufficient. Lisa Rector noted that the WG is here to figure out if there is a way to understand the tradeoffs of going that route.

- Ben Myron asked how issues will be taken into account when determining compliance and a passing grade. Lisa Rector replied that since the [test] end wouldn't be what it currently is, the new value will have to be correlated with the 4-burn steady state crib runs. Lisa clarified that in no way is anyone thinking that the results of the new method would have to meet [as-is] the NSPS/standard's limit; a formula is needed to relate/translate the two values.
- John Barnes wondered if the end of the test can be defined one way for emissions and [another] way for efficiency. Lisa Rector replied that she has seen that; there's an integrated run that measures different burn rates and cuts off PM sampling but keeps the burn going for efficiency measurements. Lisa noted that that might be a way to approach it, as Bob Ferguson was getting to. It would require research and testing regarding how the efficiency number on an integrated run correlates to the CSA B415 number and associated error bands.
- Ben Myron noted that, if going out on a limb, overall efficiency could definitely be calculated in a different way. Bob Ferguson noted that the thinking could conceivably be altered to look at a representative period of time instead of looking at the full time, in order to calculate efficiency. Bob noted that this is not impossible; it's an interesting challenge but it's not impossible. Bob further noted that CSA B415 has its downsides – for example, the method doesn't deal well with excess air during the long tail, so it's not perfect. Bob suggested that a separate group of people who have knowledge of B415 algorithms is needed.
- Rick Curkeet suggested to keep in mind that B415 is a stack loss basic traditional type method, developed from first principles. As such, there are no correlation factors or fudge factors. Rick further noted that wood burning is unlike other fuel burning because the fuel changes so dramatically during the burn cycle –consequently, the incremental calculations are never really accurate. Therefore, getting an average at the end that is a good/reasonable number relies on the expectation that errors cancel each other out during the course of the burn cycle. Rick explained that this means if a chunk of the series is left out, then some of these internal corrections are also left out. Rick opined that one wouldn't know how to compensate for leaving a period out, without doing a lot of research to determine how to adjust for the omission.
- Bob Ferguson noted that the group has tons of CSA B415 data with which a sensitivity analysis could be performed. The data could be analyzed to determine where there is a divergence. Bob explained that existing data could be used to look at where cut off could occur – for example, use the data to determine what happens [to the efficiency value] when the data/test is cut off at 60%, 75%, etc. Ben Myron noted that they have looked at that [already] and it matters more in some wood stoves than others. Ben explained that this is a difficult issue for stoves with active air controls, as there's a much bigger impact to [the calculated efficiency value] on such stoves [when data is truncated]. Bob explained that they had looked at what happened when the data was cut off at 90% and those impacts were small and so ASTM went with that [for its draft

DRAFT January 24, 2016 --- Do not Cite or Distribute

cordwood method]. However, the group didn't look at what kind of impact an 80% cut-off would have and it might be good to look at Mark's ASTM datasets and see what happens in general. Ben noted that he agreed and was not trying to sound negative, but rather just underscore that it needs to be investigated. Ben noted that the idea seems to work okay and makes sense with integrated runs on pellet stoves, using the B415 algorithms. Bob noted that he could perform a few sensitivity analyses with the current data – that he may try to take that on, although he couldn't take it on currently [due to his work load].

- Lisa asked if it would be useful if hash marks were added to the TEOM data at 50%, 75%, etc. Bob noted that he doesn't have ASTM data run through CSA B415, so if EPA wants to share stack gas, then Bob could run it through B415. Bob noted that while he can do this, it's not a trivial effort. Bob suggested speaking with Adam and Mark to see if they want to release that data. Lisa clarified with Mark and Adam that all the data would be released. Mark confirmed it would be and that all data is available in his spreadsheet, but currently it's not necessarily clear what all the columns mean. Therefore, the data needs to be cleaned up [with column headers and units added, etc]. Adam agreed and told Bob that the data would be available soon, but he was not sure exactly when. Bob noted that he has worked before with Mark's data and so could crunch the numbers for B415 once Adam and Mark are ready. Adam replied, sounds great.
- Regarding the idea of ending up with a one day test, Bob noted that even if all problems are solved and any part of the test is shortened, if the ASTM loading densities are used, it would be difficult to finish the test in one day. Bob further noted that this would be true even if the test were cut-off at 50%, because low fire tests go for a very long time. Bob suggested therefore that the WG needs to think about smaller fuel loads [in addition to] cutting-off the test time. Bob noted that all aspects will need to be considered, so that the test can be accomplished in a reasonable test day. Bob further noted that the WG would have to be creative regarding how to shorten up the test, if the goal is to accomplish all 3 burn rates in one fell swoop/one day. Bob clarified that a test day can be longer than 8 hours, but if 3 runs is the goal, then the goal should be not to exceed what a current run takes, so as not to increase costs.
- Lisa asked the labs what a reasonable length day would be. Rick Curkeet replied that the low and medium fire tests are a long day, with 12 to 16 hour days common. Rick noted that outdoor boilers may take 40 hours, which is expensive given the labor. Therefore, Rick explained that labs like being able to complete a test run in 8 to 12 hours. However, the reality is that if a run lasts 6 to 8 hours, there are also hours before and after the run. Therefore, even short test days are always longer than 8 hours.
- Ben Myron noted that, even for a high burn test day, it's an 8-hour day. Ben explained that the amount of time needed depends partly on firebox size – large fireboxes take longer (e.g., Blazeking's 4.5 cubic foot firebox takes a long time to test). The test time needs to be prorated by firebox size, therefore. Ben noted that a 1.5 cubic foot firebox is very different than a 4.5 cubic foot firebox [in terms of test time]. Ben concluded that firebox size is a huge variable that should be prorated by.

DRAFT January 24, 2016 --- Do not Cite or Distribute

- Lisa thanked Ben for his input and reiterated that firebox volume is one variable. Lisa asked if the general design of the stove is another variable – that is, tube stove vs catalytic stove. Ben replied that tube versus catalytic design was not really a variable, as both stove types are approached the same [for testing]; testers get both stoves hot.
- Bob Ferguson noted that the TEOM data collected derives from one stove, but that a different stove would provide different TEOM data. Bob clarified that he was suggesting using the % of fuel weight consumed rather than time as the metric. Using the % of fuel weight consumed will allow for more similar conditions in each stove, rather than an arbitrary time pick. Bob noted that the question is: Do they end up in same place in terms of chemistry when the same amount of fuel is burned? Bob again noted that the times will be different for different fireboxes [as Ben had explained as well].
- Lisa noted that she liked thinking about an integrated run being based on fuel weight conditions – that is, looking at scale weight data. Research wise, Lisa noted that different firebox sizes should be looked at.
- Rick Curkeet noted that it's very important to recognize that this Vigilant is not controlled. Real-time TEOM data for current stoves would show much lower peaks and those peaks would last a much shorter time. Rick noted that, within the first 10 minutes, the smoke is gone and the unit has low emissions for the duration of the burn. Rick further opined that if the g/hr metric is used and the actual burn cycle is not used, the differentiation of good versus not so good stoves could be lost.
- Lisa agreed that it's important to remember it's a g/hr metric and that something may have to be given up for everything gained [with a new test method]. Lisa noted that TEOM data has been run on a certified stove and the high fire looked similar to the Vigilant pattern (not quantitatively, but similar pattern). Lisa concluded that the patterns look similar, but more research would be needed to determine if the pattern held up. Rick agreed that the pattern may look similar on a clean stove, except that emissions will be 10% of this scale.
- Regarding the TEOM data and this concept, Lisa asked if anybody else had comments and also asked if the discussion [so far] raised any red flags for EPA.
- Adam replied that [the discussion] is a reminder that this work is foundational and valuable, but more work on current stoves will need to be done before going forward.
- Lisa noted that the goal is to get in the lab and try to do research on newer technologies with other funding. But good feedback has been received on how to look at an integrated run as an option for a cordwood test method. Lisa further noted that the ASTM method went a long way and serves as a road map for a good portion of that integrated protocol.
- Bob Ferguson noted that fuel loads will need to be considered, as well as fuel consumption (rather than time). Using fuel consumed would keep the status quo in terms of shorter test days

DRAFT January 24, 2016 --- Do not Cite or Distribute

for small stoves and longer test days for larger stoves. Bob clarified that that's how it is now and basing the new test on % of fuel consumed will keep that status quo. Bob opined that it is probably not possible to get away from longer test days for larger stoves.

- Rick Curkeet noted that right-sizing of stoves is an option and that what homeowners do would be consistent with that. However, Rick noted that forcing a big stove down to a low burn rate is not real world.
- Bob agreed and noted that forcing low burn rates on every product is different than allowing a stove to operate where it's supposed to operate.
- Rick suggested that the duration of the test would be the same if burn categories were defined based on the stove itself – for example, the low burn being defined as 30% of the high burn, etc.
- Lisa suggested that defining burn categories would be a great spot to dig into on the next call.
- Bob noted that ASTM had looked at finite fixed rates and this data is available. CSA cutoffs were used, but in the end these CSA cutoffs were taken out. Bob explained that there was support to keep them, but also a firm belief that we needed to keep the low burn rate in. Therefore the ASTM work group eliminated the percentage option. However, Bob opined that it was worth talking about again in detail.
- Lisa noted that she wanted to talk about different options and then circle around something this group could support, assuming EPA would be comfortable with connecting back to previous Method 28 burn categories.
- Bob noted that he could help bridge that gap, as the ASTM work group did analyses relevant to a fixed versus percentage defined burn rates. Bob explained that this work was done in 2010 and he can provide that data. Bob offered to look into the 30% cutoff data versus the finite burn rate data and provide it to the WG. Lisa replied, great.
- Lisa suggest that the WG discuss burn categories for the second January call.
- In response to a question from Ben Myron, Lisa noted that the [TEOM] graphs were posted to Basecamp and provided via e-mail. George Allen suggested that anyone who had questions about the graphs e-mail him and cc Lisa.
- Lisa noted that she would send an e-mail to everyone regarding the HPBA Expos and would talk again with everyone in 2 weeks [at the next teleconference meeting of the WG].
- Thank you to all. Meeting adjourned.

Message

From: Jill Mozier [jmozier@scainc.com]
Sent: 6/22/2017 4:58:54 PM
To: Lisa Rector [lrector@nescaum.org]; John Crouch [crouch@hpba.org]
CC: Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]; Graham Fitzsimons [gfitzsimons@scainc.com]
Subject: Draft Notes from June 1st Operation & Fueling Workgroup Meeting
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 6-1-2017.pdf

Lisa and John,

Attached are the draft notes from the June 1st Operation and Fueling Workgroup meeting. I've attached a PDF instead of a Word version, because the screenshots from Lisa's webinar presentation made the Word version rather large. If however, you need to edit anything, I can send you the Word version too (assuming you can receive 16 MB via e-mail).

Jill

Jill Mozier
Environmental Engineer
(919) 433-8334
Chapel Hill, North Carolina
jmozier@scainc.com
www.scainc.com



DRAFT June 22, 2017 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from June 1, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), Allen Carroll (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Roger Purinton (Jotul), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- Real-time TEOM PM graphical results were presented and discussed from the draft Washington State protocol for a cordwood test method performed in one day ("ASTM-in-a-day"). Testing is taking place at Mark Champion's lab and Lisa Rector of NESCAUM is the project lead. The goals of the Washington State protocol are to reflect typical loading and operating patterns and to address variability by completing multiple runs of the same protocol. The presentation also included photos of the different fuel charges loaded and tabular data for burn rate (kg/hr), burn time (minutes), PM (g), Load (lbs), % of load burned (%), PM rate (g/hr) and PM emission factor (g/kg).
- Mark Champion has performed 12 test runs on a medium-sized cordwood stove with multiple fuels (Birch, Maple, Red Oak, Ash) and 2 additional runs in a larger firebox. Testing also included a baseline M28-like test. Real-time TEOM PM data was collected for all tests, with filter data captured for some runs including 3 replicate runs in which TEOM plus filter data was collected. The R^2 fit between the filter pull data and the TEOM data is 0.90 or 0.95, a very clean association/fit over 30 tests. The TEOM PM is ~10% lower than the filter pull PM after equilibration, which will presumably be remedied with shorter tubing in the TEOM line.
- The protocol includes a startup charge and 3 reloads (high, medium and low fire) and embedded within the protocol is a medium-to-low fire transition. The startup phase represents typical startup by home operators and the high phase is meant to reflect what people do to fire-up the stove to temperature and build the charcoal bed. The medium phase represents the steady state burn that occurs during the day, while the low fire phase represents an overnight burn. During reload, the coal bed is still being built up and therefore the emissions captured from this protocol are from varying coal beds. The coal bed under the protocol's high fire is at the minimum allowed

DRAFT June 22, 2017 --- Do not Cite or Distribute

under EPA's Method 28 (M28), while the coal bed under the protocol's low fire is at M28's allowed maximum.

- The protocol calls for ending at 90% consumption of the fuel charge. All non-negligible PM is captured by 90% consumption and test time is cut down significantly. For the M28 tests conducted, 90% consumption generally occurs at about the 50% time/test duration mark. NESCAUM is confident that no PM is being lost by cutting off the test at 90%, but a correction factor is ultimately needed to account for cutting the time in half, given that the standard is in a g/hr format. In the medium firebox, the protocol took about 6.5 to 7.5 hours, while in the large firebox the duration was closer to 10 to 11 hours.
- Maple and Birch work well in the draft protocol. Denser woods like Oak and Ash to do not seem to work as well. Two more species are desired, but there are concerns about going to either end of the density spectrum/range.
- Based on the testing so far, NESCAUM thinks a compressed single day of testing is possible and that the Washington State protocol being developed is more representative of the "real world" than other current protocols. NESCAUM will eventually brief Washington on this protocol.

To-Do List:

- Work group members should review the results to date and post questions to Basecamp. Members are also welcome to call Lisa Rector and/or Mark Champion directly with questions.
- John Crouch and Lisa Rector will develop an agenda for the next meeting (July 6th) which may include posting written questions to the webinar screen and discussing answers together, among all work group members.

Highlights from Meeting:

- Before the meeting, Lisa Rector posted to Basecamp the Washington State Stove Protocol May 31st final draft and the Washington-NESCAUM Cordwood Consolidated spreadsheet of testing results (from Mark Champion's lab) dated May 12, 2017.
- The following people were present at roll call and after: Gregg Achmann, Sebastian Button, John Crouch, John Barnes, Bob Ferguson, Lisa Herschberger, Amanda Aldridge, George Allen, John Voorhees, Mark Champion, John Wakefield, Ben Myron, Cindy Heil, Brian from ClearStak (standing in for Kelli O'Brien), Phil Swartzendruber, Tom Morrissey, Adam Baumgart-Getz, Stef Johnson and Jill Mozier (note taker).
- Lisa reminded everyone that this is a webinar format and people need to enter their audio PIN. The agenda for today's teleconference is roll call, review results of Washington State cordwood stove protocol project, and discuss next steps. Lisa noted that her focus will be going over the Washington State cordwood project. John Crouch suggested that Lisa start at the beginning of the project, including where the funding resources are from (e.g., why it's called Washington State).

DRAFT June 22, 2017 --- Do not Cite or Distribute

- Lisa explained that this project goes back to funding received 2 years ago from the State of Washington Department of Ecology (via Rod Tinnemore). NESCAUM started working on a protocol back then but had issues securing a lab for testing, until testing started recently at Mark Champion's lab. Lisa noted that Mark has been testing nonstop for 6 weeks and the results Lisa will discuss today are from that testing. Lisa originally anticipated being able to perform a few test runs using the protocol, but Mark was able to do 12 runs on a medium cordwood stove with multiple fuels and then 2 more runs in a larger firebox. Mark also ran a baseline M28-like test and Lisa will show those results. For much of testing, Lisa explained that filter data was not collected; instead real-time TEOM data was collected. The project was able to fund 3 replicate runs in which TEOM plus filter data was collected; but, Lisa noted that for the most part TEOM data is being looked at for this protocol.
- Lisa displayed a slide on the webinar listing the Overarching Goals of the Washington State Cordwood Stove Protocol Project as the following:
 - Reflect typical loading patterns;
 - Reflect typical operating patterns; and
 - Address variability by completing multiple runs of the same protocol.
- Lisa explained that, when Rod Tinnemore reached out, NESCAUM was testing boilers [hydronic heaters] at Brookhaven National Lab, looking at operation protocols – specifically, attempting a single day of testing with multiple loads. Lisa noted that Rod Tinnemore's goal was and is that the protocol reflect typical loading patterns – that is, the way the unit is commonly operated by the consumer/home owner. Lisa further noted that [the testing protocol] cannot catch/replicate everything, but the goal is to catch/replicate the general routine. Lisa explained that NESCAUM data-logged different people's stoves and tried to assess typical use.
- Lisa noted that, from a regulatory perspective, a big concern is that there is only one data point in each burn category – meaning there is an N of 1 in each burn category. Given how variable wood burning can be, Lisa further noted that there is a real sense of needing to attain multiple runs of the same exact operational scenario. But testing is very expensive. Lisa explained that this is one of the reasons NESCAUM's goal was to compress testing into a single day. Multiple loads in a single day allows for obtaining multiple data points in a given burn category without increasing the cost.
- Lisa provided a quick overview of the protocol and noted that more details were available on Basecamp in the meeting notes from the last two teleconferences. Lisa also posted the protocol itself to Basecamp. The Protocol Overview slide is shown below. Lisa noted that the protocol includes a startup charge and 3 reloads (high, medium and low) and that embedded within the protocol is a medium-to-low transition. The startup phase is supposed to represent typical startup and the high phase is meant to reflect what people do to fire-up the stove to temperature and build the charcoal bed. The medium phase represents the steady state burn that occurs during the day, while the low fire phase is meant to represent an overnight burn. Lisa concluded that these are the different operating scenarios this protocol attempts to address/replicate.

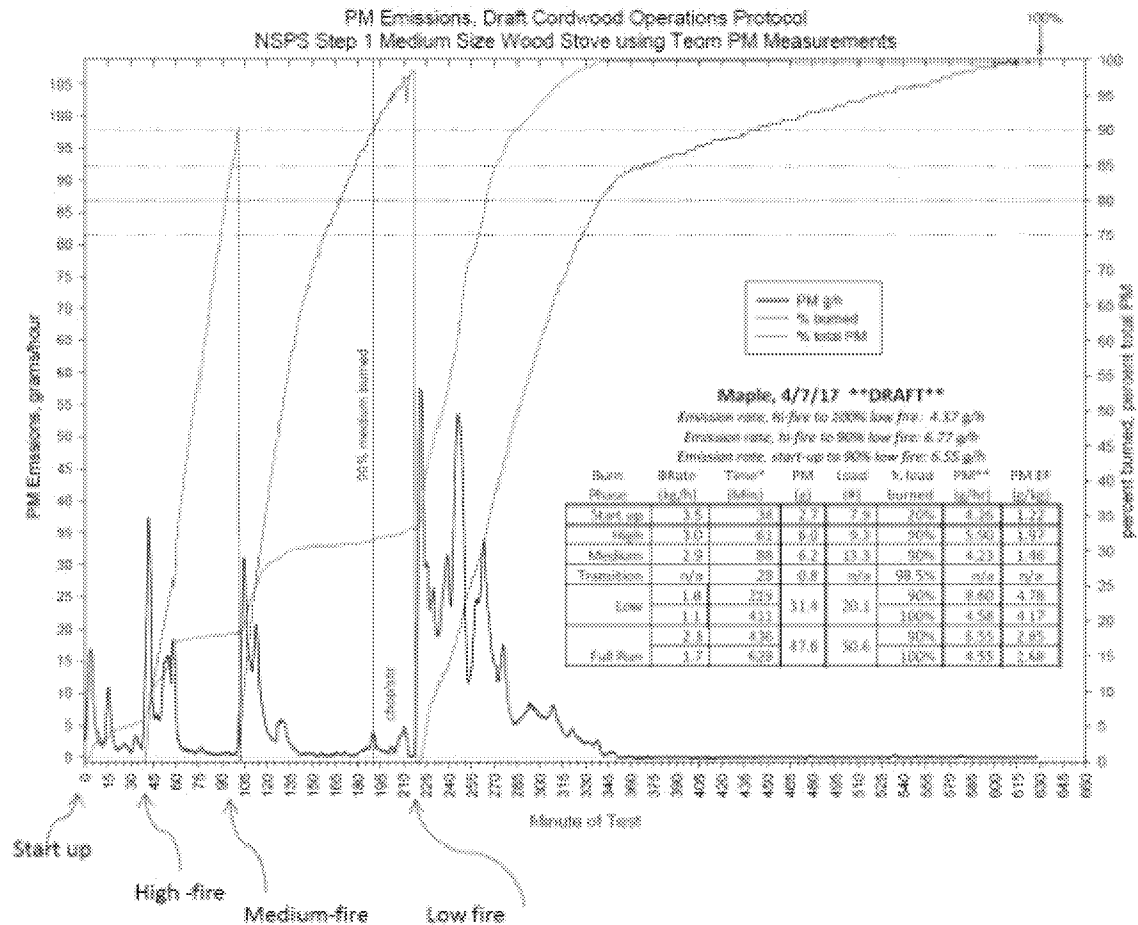
DRAFT June 22, 2017 --- Do not Cite or Distribute

Protocol Overview

- Compress entire protocol into a single day test
 - Burn phases: startup, high, medium, medium-low transition, and low
 - Phases attempt to reflect common daily user practices such as start-up and reloads.
 - Phases end when 90% of fuel charge is burned.
 - Three reloads during the protocol, with different coal bed weights.
 - Piece sizes vary with phase:
 - Start-up kindling and starter – 4 lb/ft³
 - High-fire: small pieces – 5 lb/ft³
 - Medium-fire: large pieces – 7 lb/ft³
 - Low-fire: mix of small and medium pieces – based on firebox capacity – min of 9 lb/ft³
- Lisa noted that consuming 100% of the fuel load means that a one-day test is not possible. Therefore, the protocol calls for ending at 90% consumption of the fuel charge. During reload, the coal bed is actually still being built up. So, the emissions captured from this protocol are from varying coal beds. Lisa noted that the coal bed under the protocol's high fire is at the minimum allowed in M28, while the coal bed under the protocol's low fire is at M28's allowed maximum.
- Lisa explained that the protocol calls for using best practices with the loads. For example, the startup load uses kindling plus starter pieces like ASTM's protocol. Smaller pieces are used for the high fire phase, while large pieces are used for the medium phase. A mixture of small and large pieces are used for the low fire phase [to simulate an overnight burn's load]. The protocol calls for 4 lb/ft³ (1 lb/ft³ kindling plus 3 lb/ft³ starter pieces), then 5 lb/ft³ for the high fire, followed by 7 lb/ft³ for the medium fire. The final low fire phase calls for filling the stove to the top and this load [in Mark's testing so far] varied from 9 lb/ft³ to 16 lb/ft³, depending on the fuel and firebox size, but a minimum of 9 lb/ft³ is required.
- John Crouch asked what the protocol required regarding moisture content. Lisa replied that the moisture content range is the same that is allowed under M28 (a range of 19 to 25%). Lisa noted that they haven't looked at moisture content closely in this protocol, in all honesty, because so many things impact the outcome when moving away from M28, that certain things were not changed [from what M28 calls for]. However, Lisa noted that she would love to discuss this further if people think moisture content also needs to be looked at and varied.
- Lisa displayed the below graph on the webinar screen and noted that there is one of these charts/graphs for every single run. The black line is PM measurement. Peaks occur at startup, high fire, medium fire and low fire. In this run, the medium to low transition lasted 45 minutes, but in other runs this transition may only last a minute or so. Lisa explained that [the medium to low transition occurs because] the stove must meet certain parameters before going into low the low fire phase. For example, there shouldn't be big pieces left in the charcoal bed. The blue line is the

DRAFT June 22, 2017 --- Do not Cite or Distribute

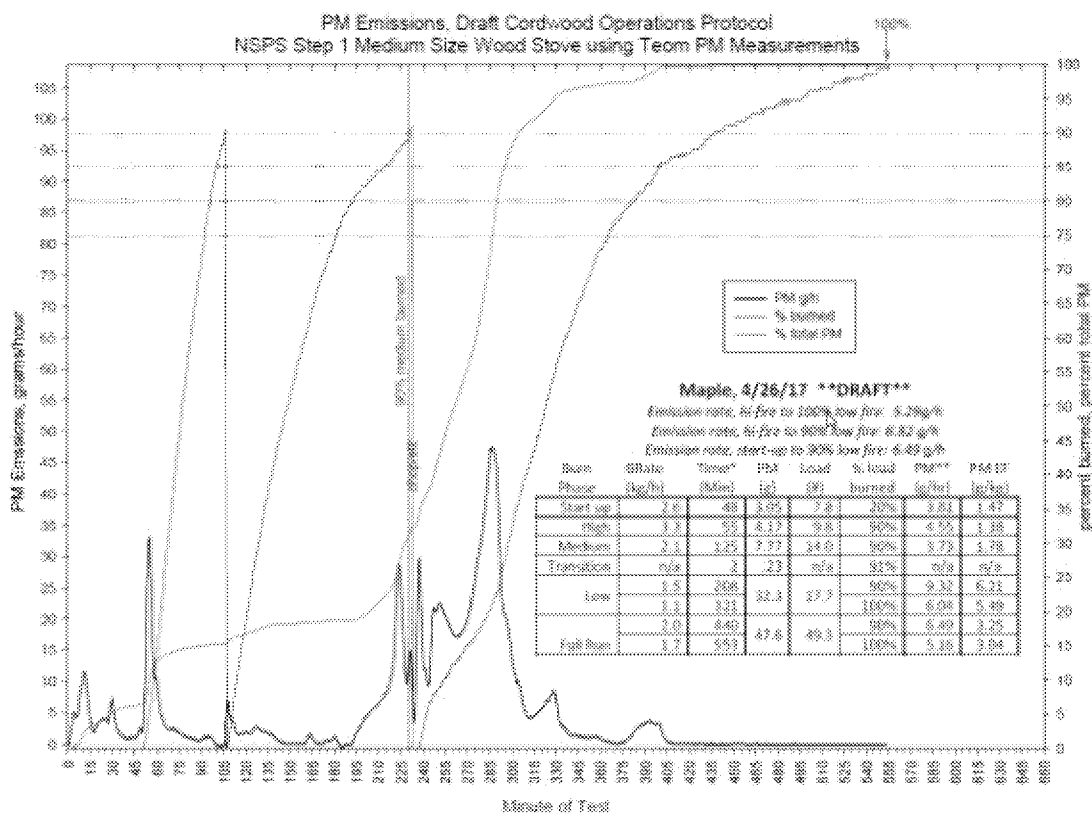
amount of fuel charge burned. For this run, the high fire initially went to 98% and the medium fire was stopped at 90%, before transitioning to the low fire. But, Lisa explained the data is run to 100%. The red line is cumulative PM emissions. Lisa noted that the proportionality of total PM emissions to fuel consumption can be readily seen.



- Lisa noted that the embedded table is rather complicated with lots of information, but the purpose is to be able to see all data on one page. Lisa explained that the high fire emission rate is calculated by eliminating start-up and based on burning 100% of charge, and then calculated based on 90% of charge (resulting in 6.77 g/hr). Next, startup was included in the calculation. Lisa noted that the calculations were done in this way for 2 reasons: (a) to determine how much stopping at 90% impacts the results, and (b) to determine how much including startup impacts the results. Lisa noted the remaining columns in inlaid chart including columns for burn phase (startup, high, medium, transition, low and full burn), burn rate (kg/hr), burn time (minutes), PM (g), Load (lbs), % of load burned (%), PM rate (g/hr) and PM factor (g/kg). Lisa concluded that there is lots of data on this sheet and these sheets are prepared for all runs plus M28. Lisa also noted that the high and medium runs stop at 90% fuel consumed, but results are provided for the low runs at both 90% and 100%.

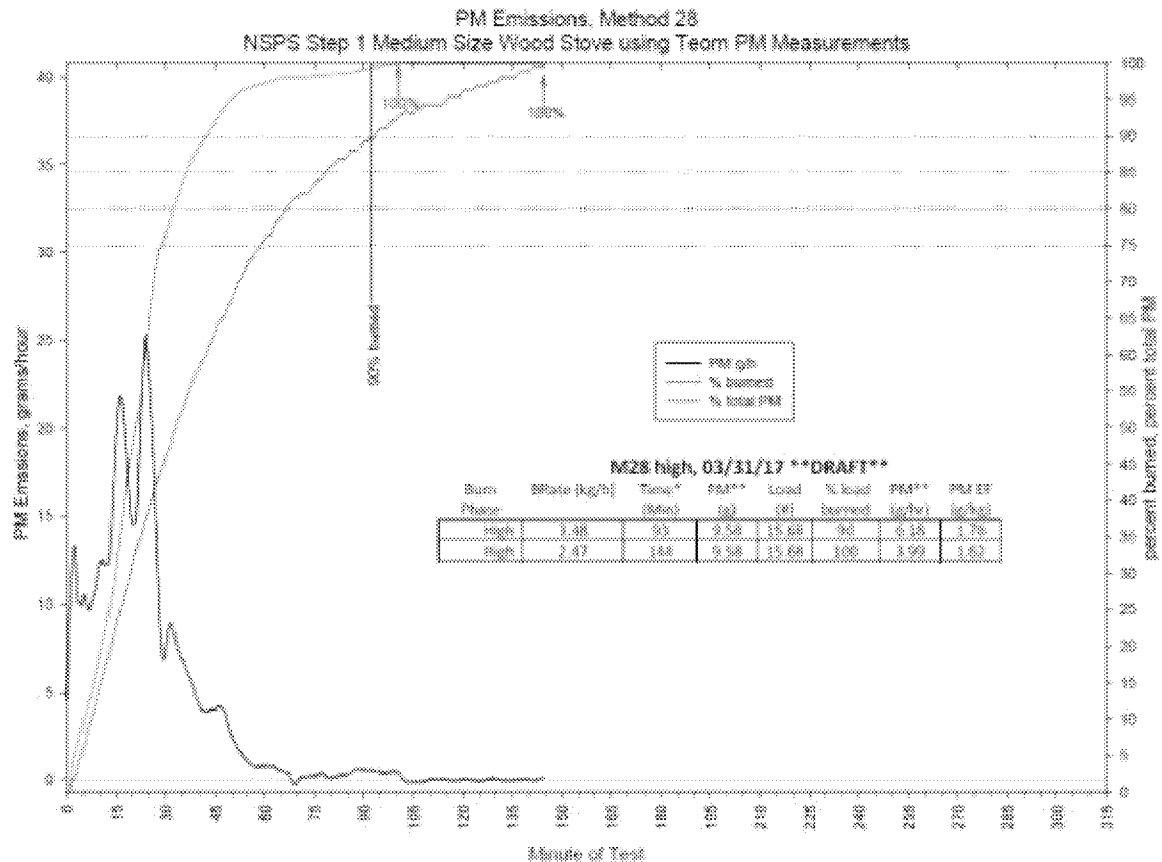
DRAFT June 22, 2017 --- Do not Cite or Distribute

- Ben Myron asked Lisa how the g/hr number was determined and Lisa asked George Allen to explain. George explained that Mark Champion measures and records tunnel flow in 1-minute intervals. The TEOM's PM concentration measurements plus the tunnel flow are converted to a real-time g/hr measurement. Ben asked for confirmation that therefore there were no filter pulls. George confirmed that there were no filter pulls in the way Ben was thinking of a filter pull, although the TEOM itself does have a filter. George further confirmed that the R^2 [coefficient of determination] fit between the filter [pull data] and the TEOM [data] is 0.90 or 0.95 – that is, there is a very clean association/fit over the 30 tests.
- Bob Ferguson asked what the relationship is between the filter pull and TEOM data. George replied that the TEOM PM is ~10% lower than filter pulls after equilibration. George explained that he thinks some PM is being lost in the [TEOM] line which was longer than needed. Therefore, the line has been modified and the expectation is that the numbers will tighten up. George noted that the TEOM and filter pull results should basically be the same number, if everything is being done right.
- Lisa displayed another Maple graph example to the Webinar and noted that in this test the transition from medium to low burn was only 2 minutes. Lisa explained that there can be big variations in the transition time, which is basically the time it takes to get to the point that there are no yellow flames left. During the transition time, the operator opens up the stove and chops up the large pieces. Lisa explained that the transition time varies as it can take a long time to burn that piece down, or a short time.



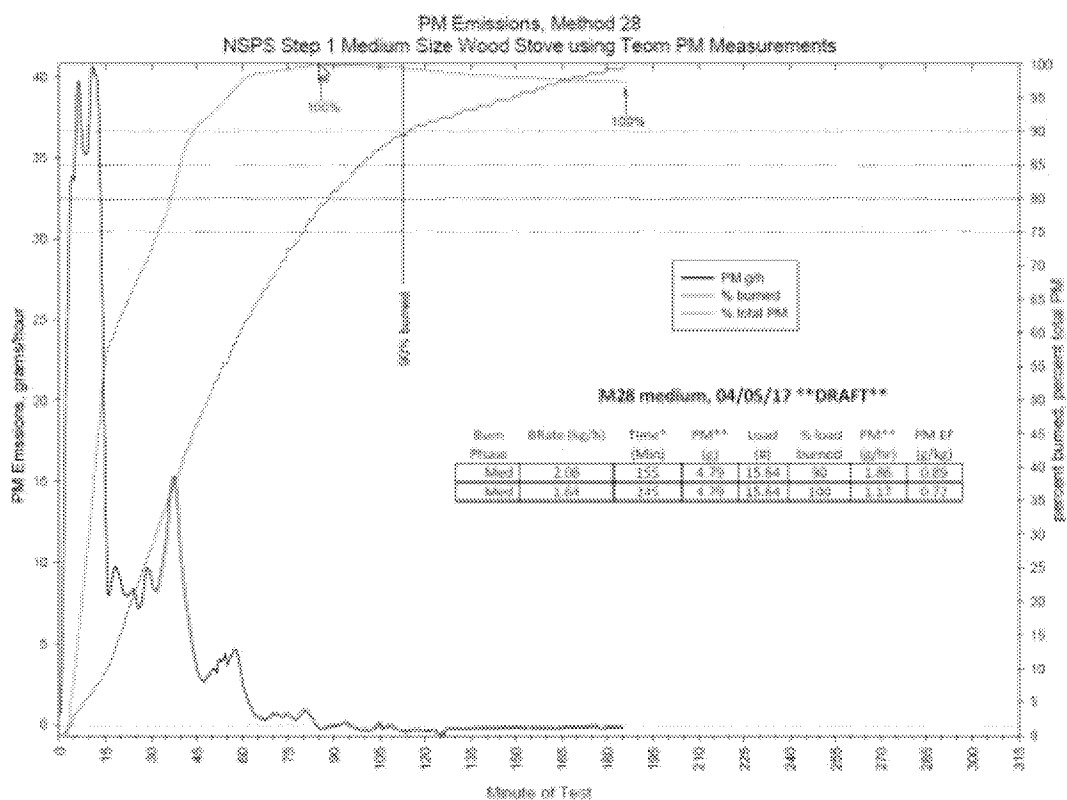
DRAFT June 22, 2017 --- Do not Cite or Distribute

- Lisa displayed the results from the M28 run (below), noting that Mark Champion did do M28 pulls and they have been looking at when 90% consumption occurs. This generally occurs at about the 50% time/test duration mark. For example, in the below graph, the PM was at 99% when the test was only half over.

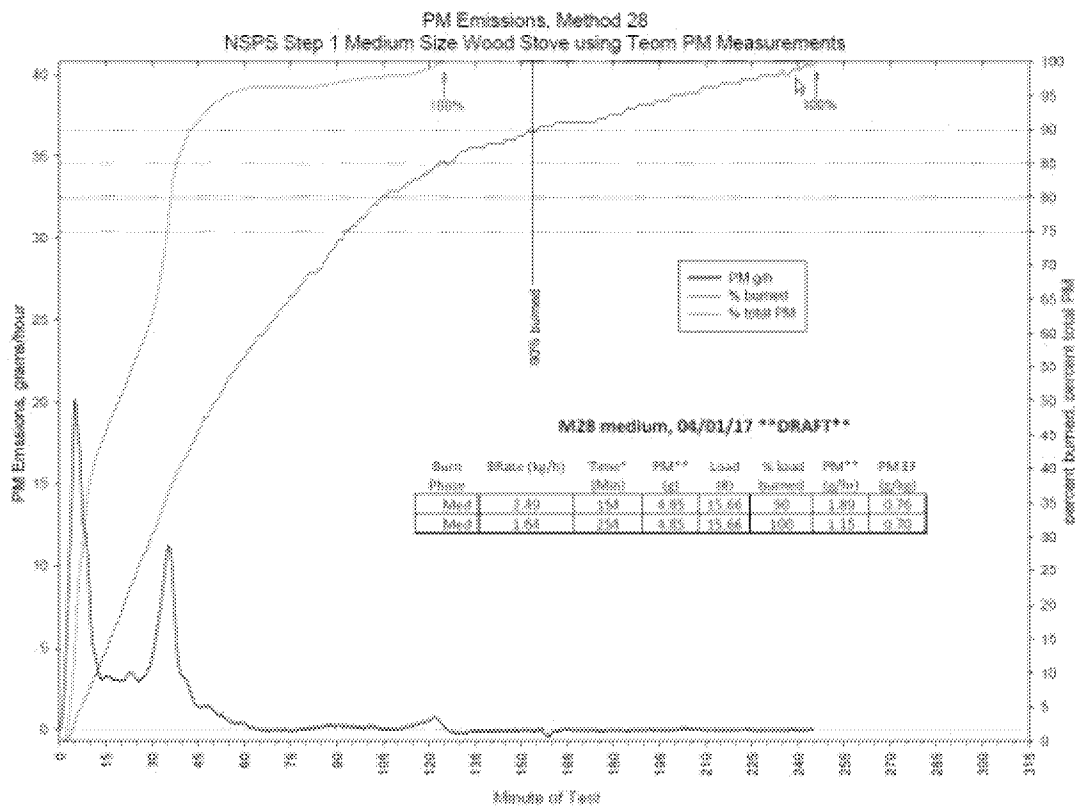


- Lisa next displayed a medium burn graph/chart (below), noting the “PM droop”. Lisa explained that this probably is caused by some mass coming off the filter, some “blow off”. This occurs sometimes, not always and would explain why [the red cumulative PM] line goes down. George Allen noted that it could be water or SVOCs, or some combination of both, coming off of the filter.

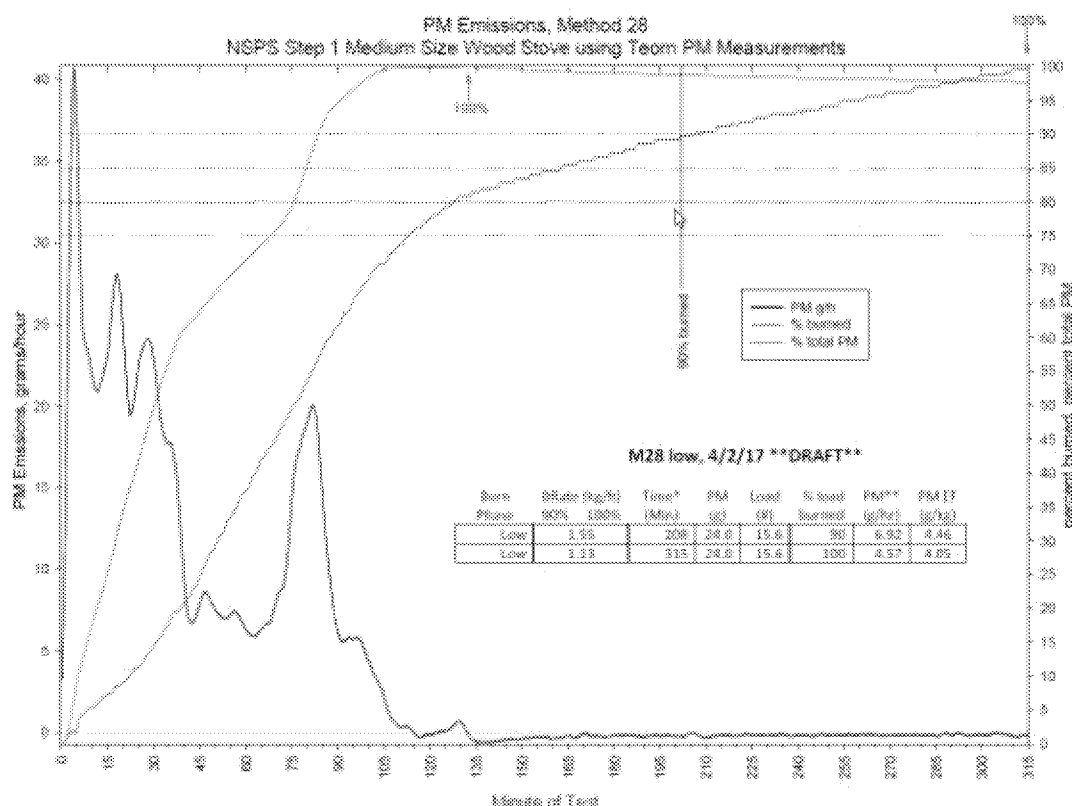
DRAFT June 22, 2017 --- Do not Cite or Distribute



- Lisa next displayed the following graphs to the Webinar screen, from other test runs:



DRAFT June 22, 2017 --- Do not Cite or Distribute

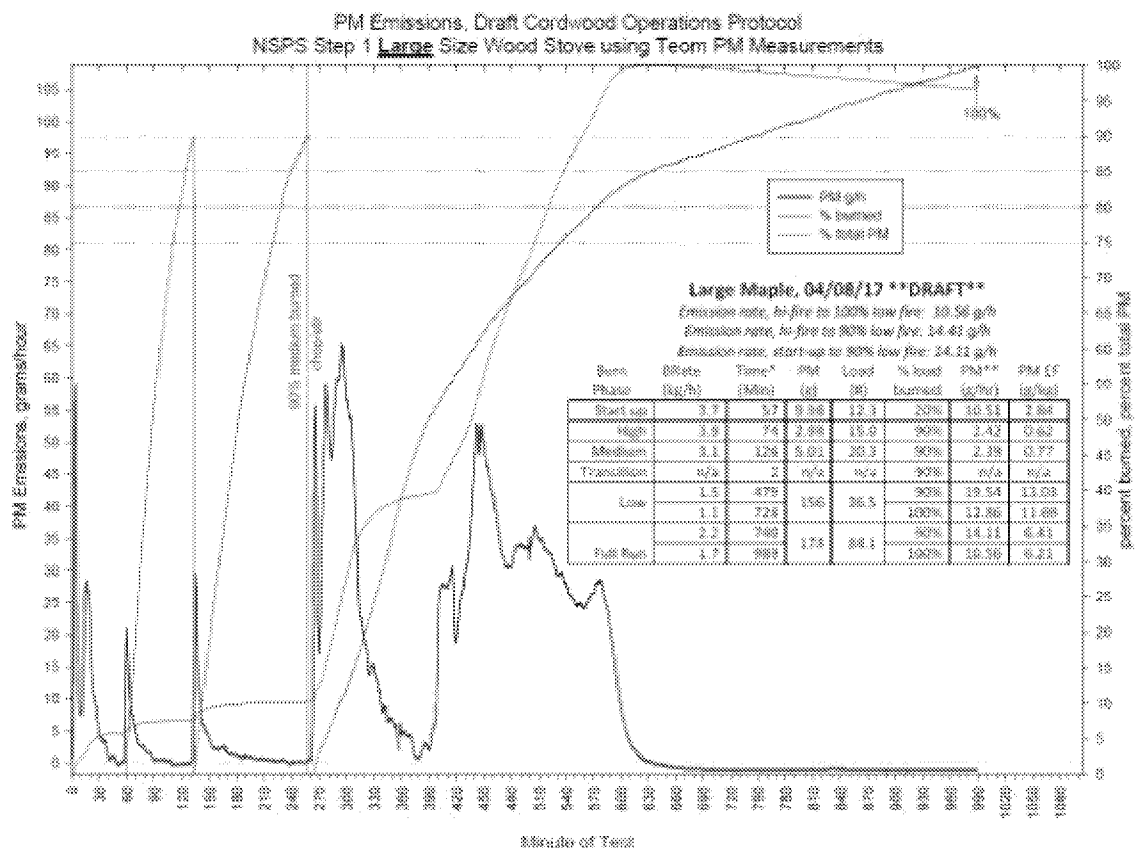


- Lisa noted that she [and George] don't think any PM is being lost by cutting off at 90% [of fuel consumed] but a correction factor is needed to account for cutting the time in half [given that the standard is in a g/hr format]. Lisa further noted that there are no concerns PM-wise and [based on the data collected so far] the test could even stop at 85% [of fuel consumed]. Lisa concluded that NESCAUM plans to do more [testing] with additional funding, but she is feeling confident that ending PM at 90% works well.
- John Voorhees asked what the volume of the firebox is and Lisa replied that it is 2 cubic ft. John also asked if, when referring to fuel being burned at 90%, whether Lisa and Mark witnessed any non-volatilized fuel. Lisa noted that, when going to a different phase/burn rate, in all cases the stove is pretty close to no yellow flame, but there were some solid pieces left. Mark Champion noted that he agreed in general [with Lisa's description]. Mark said his recollection is that the most volatile material is there between startup to the high burn phase. Mark noted that he recalled that transition point was about 10 minutes. John Voorhees noted that his question was answered and he was merely curious about what had been observed.
- Lisa noted that there are allowances [in the protocol] for fuel adjustments. In fact, the protocol requires the operator to do a fuel adjustment if the load is not burning. On an early load, Lisa explained that she had done a bad job and the wood wasn't really burning. In this case the protocol requires fuel adjustment, because yellow flames are required for testing. Mark noted that he recalled the protocol "allowed" adjustments in other phases. Lisa clarified however that,

DRAFT June 22, 2017 --- Do not Cite or Distribute

during the medium burn, adjustment is required if there's no yellow flame. Lisa explained that, between the medium and low phases, the operator is trying to get a nice hot coal bed before the overnight [low] burn.

- Lisa displayed the below graph to the Webinar screen, noting that the results are from the two runs on a large ~3 cubic foot firebox. Lisa further noted that the protocol duration was longer: In the medium firebox the protocol took about 6.5 to 7.5 hours, while in the large firebox the duration was closer to 10 to 11 hours. Lisa noted therefore that the testing requires a longer day with larger units and the question is whether the low fire test could end at 85% [fuel consumed]. Based on the below PM results, Lisa noted that the test could have ended at 630 minutes (almost 2 hours earlier) and not missed any of the PM. Lisa concluded that the goal is a realistic protocol, but the test protocol should not be requiring PM measurements when there is no PM.



- Lisa continued by displaying the following photos on the Webinar screen. First, Lisa displayed a photo of the Birch wood loads, with the startup (cold start) charge on the left, followed by the high and then medium charges. (Lisa noted that she would show the low charge in an upcoming slide.)

DRAFT June 22, 2017 --- Do not Cite or Distribute



- The next photo showed the start-up, high and medium Maple charges:



- Next, Lisa showed a photo of the Oak charge (below), noting that it looked small [relative to the other wood species] due to how dense Oak is. Lisa noted that in general using dense wood in the protocol is a concern. Lisa further noted that she doesn't have a wide density range in the draft protocol as she is grappling with this issue – that is, which fuels are appropriate to have in the protocol and whether a density range or specific wood species should be examined for use in the protocol. [Bob Lebens joined the call at this point.]



DRAFT June 22, 2017 --- Do not Cite or Distribute

- John Crouch remarked, for the state people who were not on the ASTM calls, that these [issues being raised by Lisa in her draft protocol] are exactly the difficulties run into, in terms of fuel loads and fireboxes for a medium load, and it gets worse.
- Lisa agreed that it gets worse, noting she cursed at Oak fuel for several reasons including that it was difficult to get the moisture content right and she received Oak splinters several times. Lisa further noted that Ash was also looked at, which is another dense wood. Lisa observed that wood species on the extremes of the [density] range do burn differently – for example, how these wood logs hold their shape and what their coalbeds look like are very different. Lisa explained that currently Maple and Birch are in the draft protocol and these species work well. Two more species are desired, but there are concerns about going to either end of the density spectrum/range.
- Next, Lisa showed the low burn fuel charge using Birch (photo below). Lisa noted that the entire pile shown was loaded into the stove, except the two smallest pieces. This low burn load was a mix of small and large pieces, based on a pile of wood that Mark had split. Lisa explained that they measured the weight of this pile (as they knew it would be close, but would be slightly over what would fit in the stove), then loaded the stove and subtracted out what didn't fit. Lisa noted that, for Birch, the loading density was 9 lb/cubic foot for the low fire phase.



- John Crouch asked if each of these pieces were dropped, per ASTM protocol for pieces with bark, to determine if the bark stays on. Lisa replied that the pieces were not purposefully dropped and so they did not follow ASTM protocol, but the pieces were inadvertently dropped. Mark agreed and clarified that although the draft Washington State protocol didn't follow ASTM protocol, each piece was handled quite a bit. Bob Ferguson clarified that the objective of the ASTM bark protocol is to ensure that the bark on pieces is not loose or ready to fall off, and further noted that everyone [on the ASTM subcommittee] had been concerned about it. John Crouch concluded that the bark can be a tremendous confounder, although it's not certain how big a confounder it is and the variability may differ with different species.

DRAFT June 22, 2017 --- Do not Cite or Distribute

- Lisa noted that it is easy to run the [Washington State] protocol with birch because it essentially comes with starter fuel – that is, the bark helps light-off. Bob Ferguson noted that ASTM found that some species, after drying, don't hold bark well after being split. This is especially true of maple and oak: shrinkage occurs and the bark comes off. Bob noted that some species lose most of their bark. Lisa agreed.
- Regarding density versus species, Bob Lebens commented that he understood Mark Champion did some testing for EPA using dimensional lumber for different species and that a species effect was observed. Bob wondered if specific gravity/density was also calculated [for those tests]. Adam Baumgart-Getz explained that there is some data on each species' density [from Mark Champion's testing for EPA] and that EPA is waiting to hear back from Stef Johnson that he's comfortable releasing data, and then EPA will release the. Adam noted that, off the top of his head, he didn't remember what the correlation was between density and emissions [based on the test data].
- Lisa asked Mark Champion if he was burning wood from the same tree [for his EPA species testing]. Mark replied that Birch, Maple and Ash loads all came from the same tree (for dimensional lumber and cordwood loads); but this was not true for the Oak testing. Lisa noted that this [the fact that the dimensional lumber and cordwood came from the same trees for Birch, Maple and Ash] meant there would not be huge variations [in specific gravity]. Mark furthermore noted that the specific gravity measurements made also apply to this [Washington protocol] work too, as it's the same wood: that is, on average the specific gravities are the same [as the EPA species testing] for all cordwood in the Washington protocol work.
- Lisa noted that the species issue could be looked at, that a lot of time could be spent working on the species issues. But, forestry experts have indicated that more than the specific gravity is driving the differences/variability – the resin content also varies and causes variability. So, it's complicated, Lisa noted, and concluded that specific gravity will continue to be looked at in terms of how to deal with it when moving to the cordwood protocol.
- Lisa next displayed a photo of kindling at a loading density of 2 lb/ft³ (below), noting that she had felt like that was too much kindling -

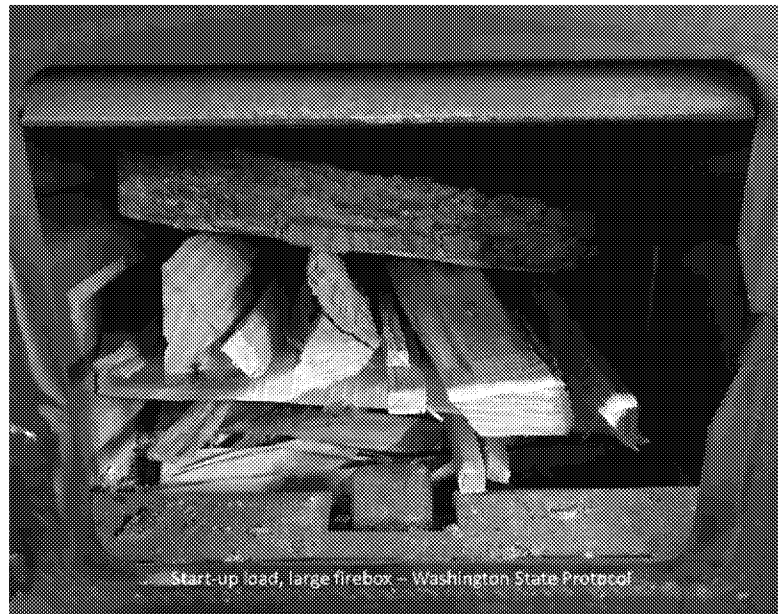


DRAFT June 22, 2017 --- Do not Cite or Distribute

- Lisa therefore changed the kindling to what is shown in the below photo along with the start-up pieces and newspaper in 3 layers (for a medium firebox) -



- The next photo Lisa displayed was of the start-up load in the large firebox -



- Lisa explained that these loads were burned/started bottom-up, but Mark also ran start-up as a top-down burn as well. Lisa noted that the operator does not have to load the start-up all at once. Mark clarified that the same was always done for consistency – some top downs, some semi top downs – but all pieces of the load were in at the beginning.
- The next photo Lisa displayed showed the fire right after the high fire charge was loaded -

DRAFT June 22, 2017 --- Do not Cite or Distribute

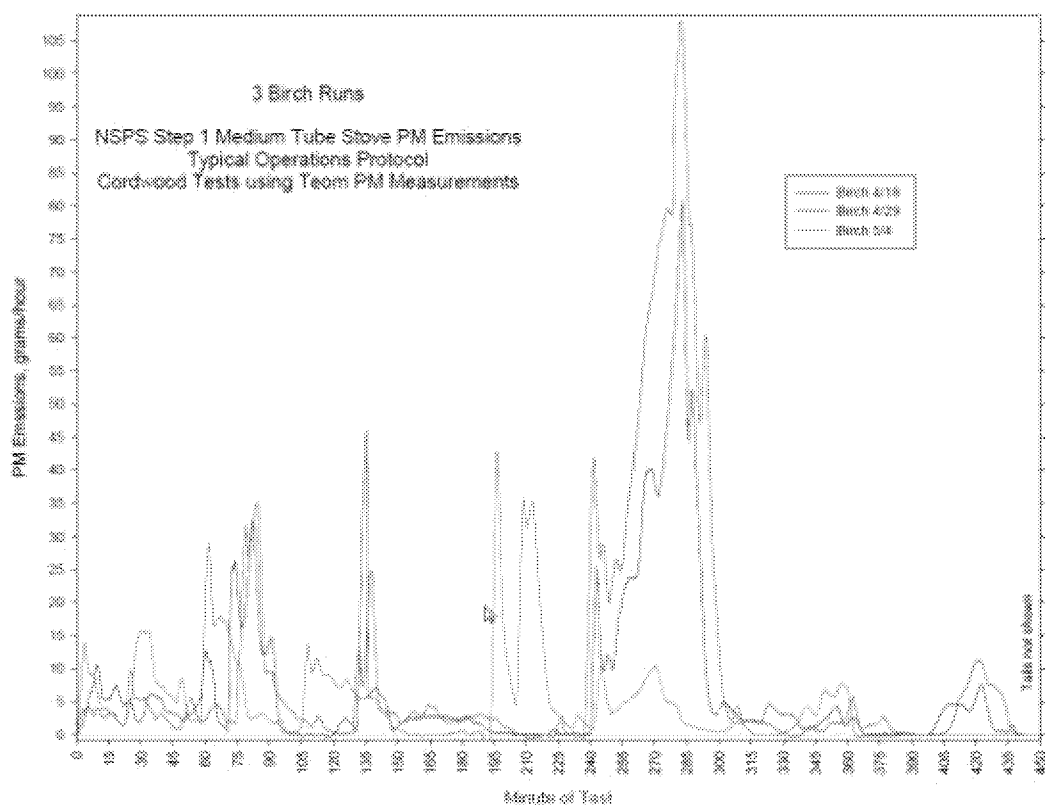


- Lisa noted that the below photo shows the coal bed just before the low load was added –

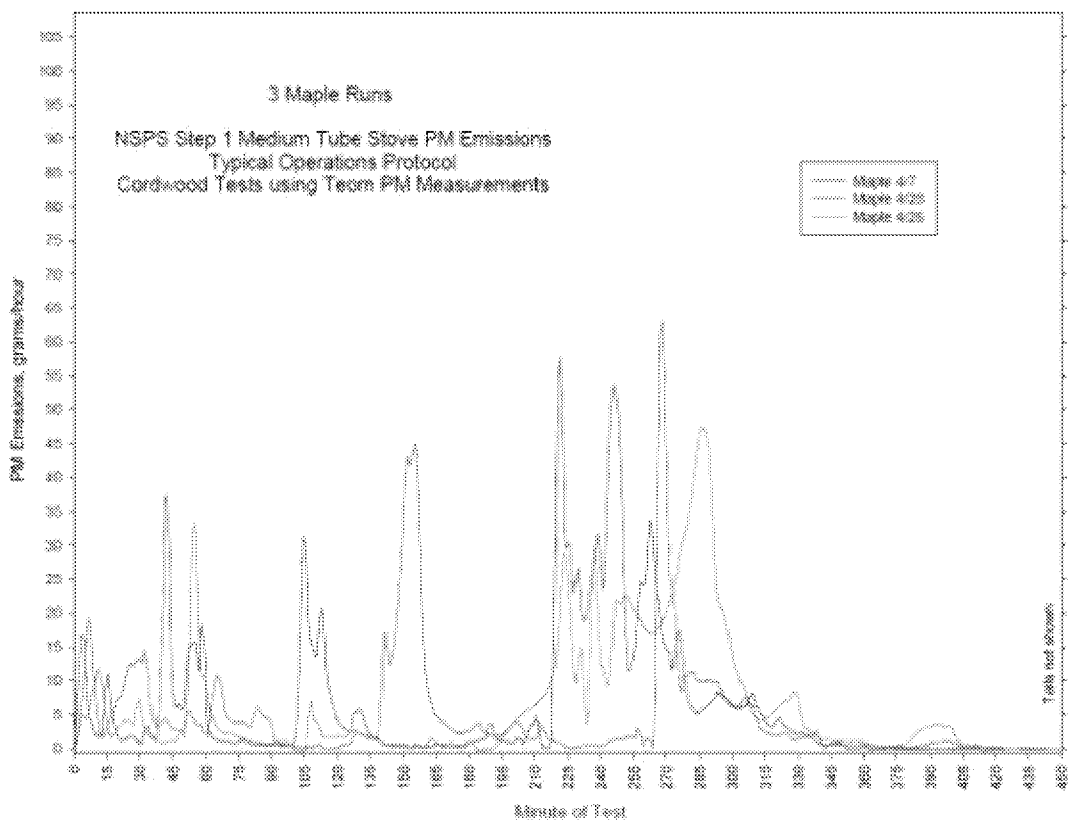


- Lisa asked if there were any questions before discussing the data, but the workgroup had none.
- Lisa noted that the testing is trying to look at replicate runs where there's filter data and TEOM data. Lisa further noted that an **N of 3 from the same species and same tree** is as good as it's going to get, in terms of determining how consistent the emissions outcomes are. The below photo shows TEOM PM measurements from 3 Birch runs [from 3 different test dates], all overlaid. Lisa noted that they fall into a similar pattern, but there are still differences -

DRAFT June 22, 2017 --- Do not Cite or Distribute



- Lisa displayed a similar graph based on 3 replicate Maple runs –



DRAFT June 22, 2017 --- Do not Cite or Distribute

- Lisa displayed the below Birch and Maple data, entitled “Analysis Full Runs”, including burn rate (kg/hr – note that burn rate units are wrong on below slide), burn times (minutes), PM (g), load weight (pounds), PM rate (g/hr) and PM emission factor (g/kg) for various run dates. Lisa noted that, especially with Birch, there was high variability across both the PM rate (which varied from 5.4 g/hr to 11.38 g/hr) and the PM emission factor (which varied from 2.16 g/kg to 3.07 g/kg). Lisa further noted that the burn rates were fairly similar (from 2.2 kg/hr to 2.5 kg/hr) and the burn times varied by about an hour. Lisa pointed out that, the higher the burn rate, the cleaner it was and shorter the burn time. Lisa also noted that the results were tighter for Maple than for Birch.

Analysis Full Runs

Birch

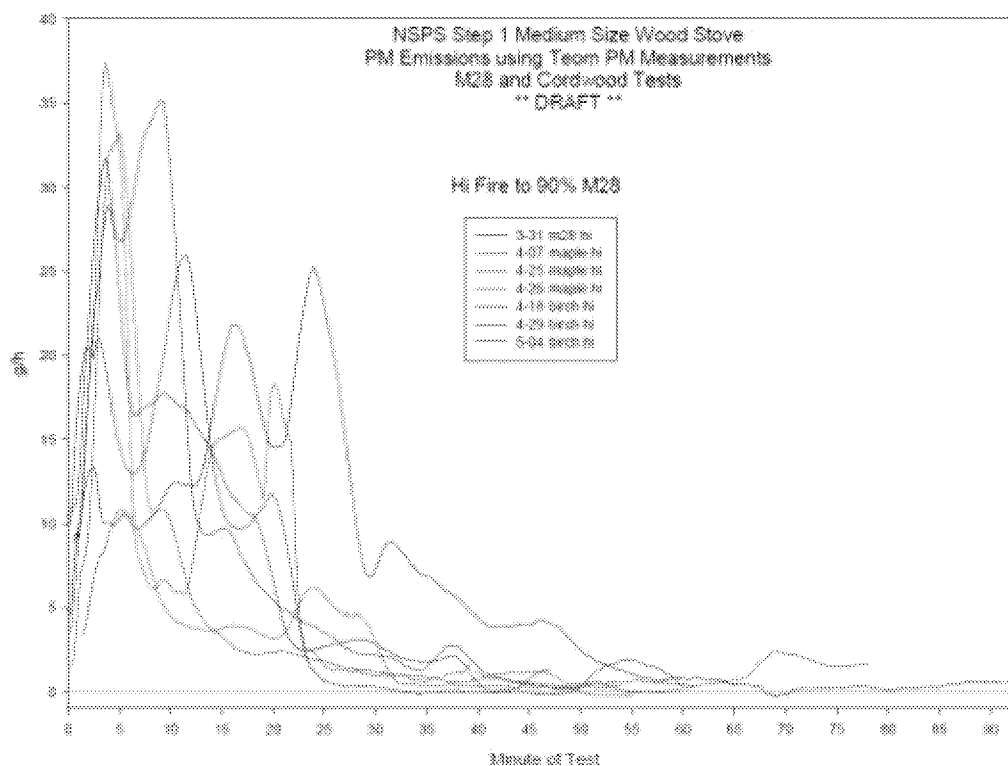
Run	Burn Rate (g/kg)	Time (min)	PM (g)	Load (#)	PM (g/hr)	PM EF (g/kg)
4/18	2.2	460	51.7	50.9	6.74	3.07
4/29	2.3	430	76.6	51.8	11.38	4.95
5/4	2.5	392	35.3	49.3	5.40	2.16

Maple

Run	Burn Rate (g/kg)	Time (min)	PM (g)	Load (#)	PM (g/hr)	PM EF (g/kg)
4/7	2.3	436	47.6	50.5	6.55	2.85
4/25	2.2	432	35.6	47.9	4.94	2.25
5/4	2.0	440	47.6	49.3	6.49	3.25

- Lisa noted that she then started dissecting the data by burn phases. The next graph (below) shows **the High Fire TEOM PM measurements** to 90% fuel consumed, for 3 Maple and 3 Birch runs plus an M28 high fire run (in black) all overlaid -

DRAFT June 22, 2017 --- Do not Cite or Distribute



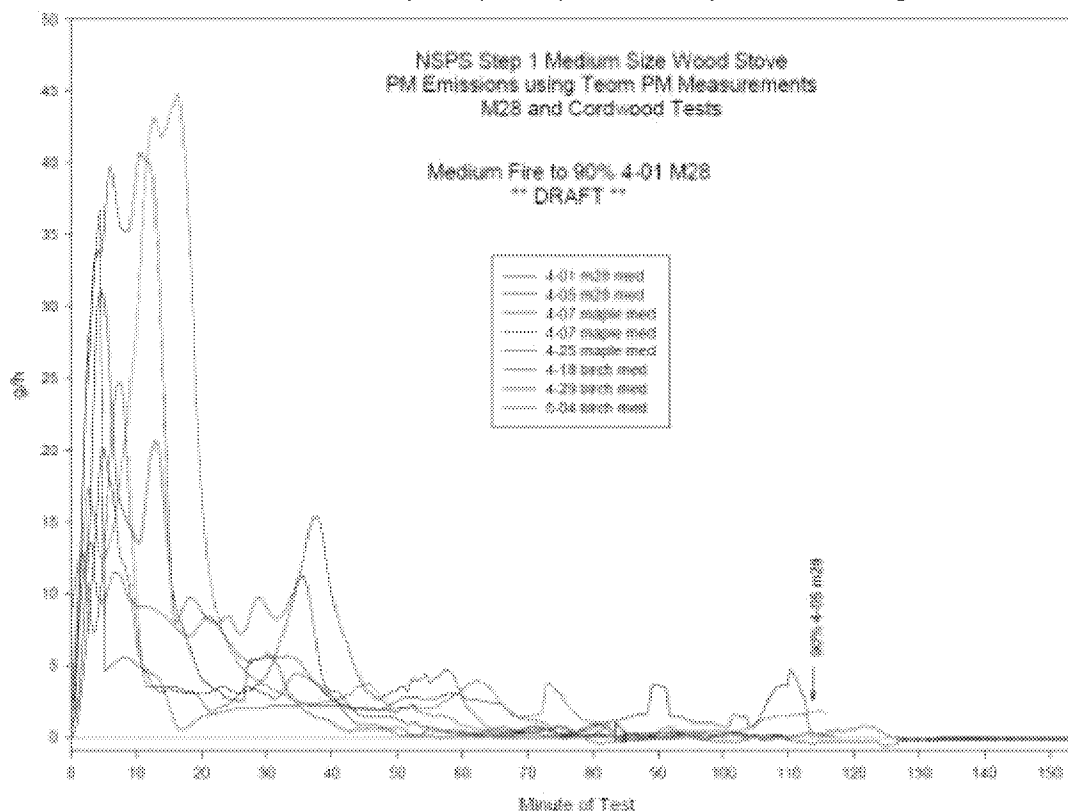
- The next slide shows emission outcomes and burn rates in tabular form. Lisa noted that the burn rate on 4/25 was much lower than the burn rates for the other runs and may be an outlier, which Lisa would want to test again. On Birch, the burn rates were high and there was tight agreement in the PM emission factor (g/kg). The agreement was not as tight in the Maple runs, and the Douglas fir results fell between the Birch and Maple results. The PM emission rate (g/hr) at 90% consumption ranged from 2.44 to 7.61 g/kg, with the M28 PM emission rate (at 90%) at 6.18 g/hr. (Note: Burn Rate units are listed incorrectly below; the units should be listed as kg/hr.)

Comparison of High Fire Phase Data

Run Species	Burn Rate (g/kg)	Time (min)	PM (g)	Load (#)	PM (g/hr) @90%	PM EF (g/kg) @90%
M28 Doug Fir	3.48	93	9.58	15.68	6.18	1.78
4/7 Maple	3.0	61	6.0	9.3	5.90	1.97
4/25 Maple	2.4	78	3.17	9.5	2.44	1.02
4/26 Maple	3.3	55	4.17	9.8	4.55	1.38
4/18 Birch	3.3	59	6.08	9.8	6.18	1.87
4/29 Birch	3.6	54	7.15	9.9	3.33	1.85
5/4 Birch	4.1	47	5.96	9.8	7.61	1.86

DRAFT June 22, 2017 --- Do not Cite or Distribute

- Lisa displayed a slide showing the **TEOM PM measurements for the Medium Fire** on Maple and Birch and for M28 to 90% consumption (below), followed by a slide showing the tabular results -

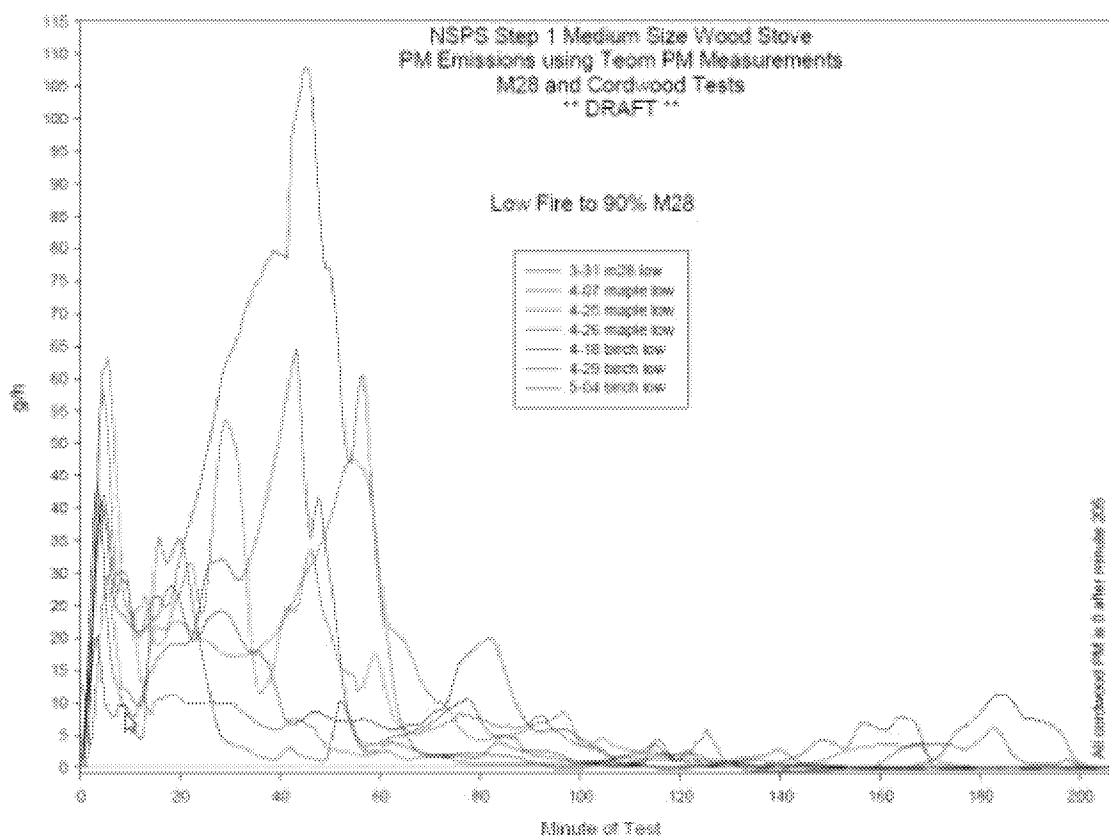


Comparison of Medium-Fire Phase

Run Species	Burn Rate (g/kg)	Time (min)	PM (g)	Load (#)	PM (g/hr) @90%	PM EF (g/kg) @90%
M28 Doug Fir	2.49	154	4.85	15.66	1.89	0.76
	2.08	155	4.79	15.64	1.86	0.89
4/7 Maple	2.9	88	6.2	13.3	4.23	1.46
4/25 Maple	2.3	117	12.7	13.6	6.51	2.83
4/26 Maple	2.1	125	7.77	14.0	3.73	1.78
4/18 Birch	2.9	90	4.45	13.0	2.97	1.02
4/29 Birch	2.8	95	5.34	13.6	3.38	1.2
5/4 Birch	3.4	82	5.18	14.0	3.79	1.11

DRAFT June 22, 2017 --- Do not Cite or Distribute

- Lisa noted that for the medium fire, the burn rate results ranged from 2.1 kg/hr to 2.9 kg/hr. (Note that the slide displays incorrect units.) Lisa further noted that the g/hr PM rate results were much lower on M28 (1.86 to 1.89 g/hr) than on the draft Washington cordwood protocol (2.97 to 6.51 g/hr). Lisa explained that the M28 were two separate runs/tests which were consistent in terms of results, but the cordwood protocol resulted in higher PM rate (g/hr) and higher PM emission factor (g/kg) at the medium fire/burn rate. Lisa noted that this is interesting, given the 7 lb/ft³ loading density.
- John Crouch noted that this is a stove tuned to burn M28, so the stove will perform best at that piece size, regardless of loading density. John further noted that stoves will be tuned to the new protocol [whatever protocol undergirds the standard]. Lisa agreed and thanked John for underscoring that fact.
- Lisa next displayed a **Low Fire graph of TEOM PM measurements** (below), noting that the Douglas Fir M28 test run is represented by the black line, overlaid with the other Maple and Birch runs on the low fire draft Washington protocol. Lisa reiterated that John Crouch's point is correct: M28 using Douglas Fir is what the stove is tuned for.



- Lisa then displayed a tabular comparison of the Low Fire data (below). The numbers shown in black are to 90% consumption, while the numbers shown in green are to 100% consumption. Lisa noted that this data gives a sense of how much extra time is added on [to go from 90% to 100% consumption] and how that affects burn rates. Lisa further noted that, for low burns, the burn

DRAFT June 22, 2017 --- Do not Cite or Distribute

rate (in kg/hr, incorrect on slide) seemed high at 90%, but when taken out to 100%, the burn rate drops to 1.1 kg/hr. Lisa remarked that Bob Ferguson's initial prediction was correct – that is, that the stove would not get below a 1.1 kg/hr burn rate.

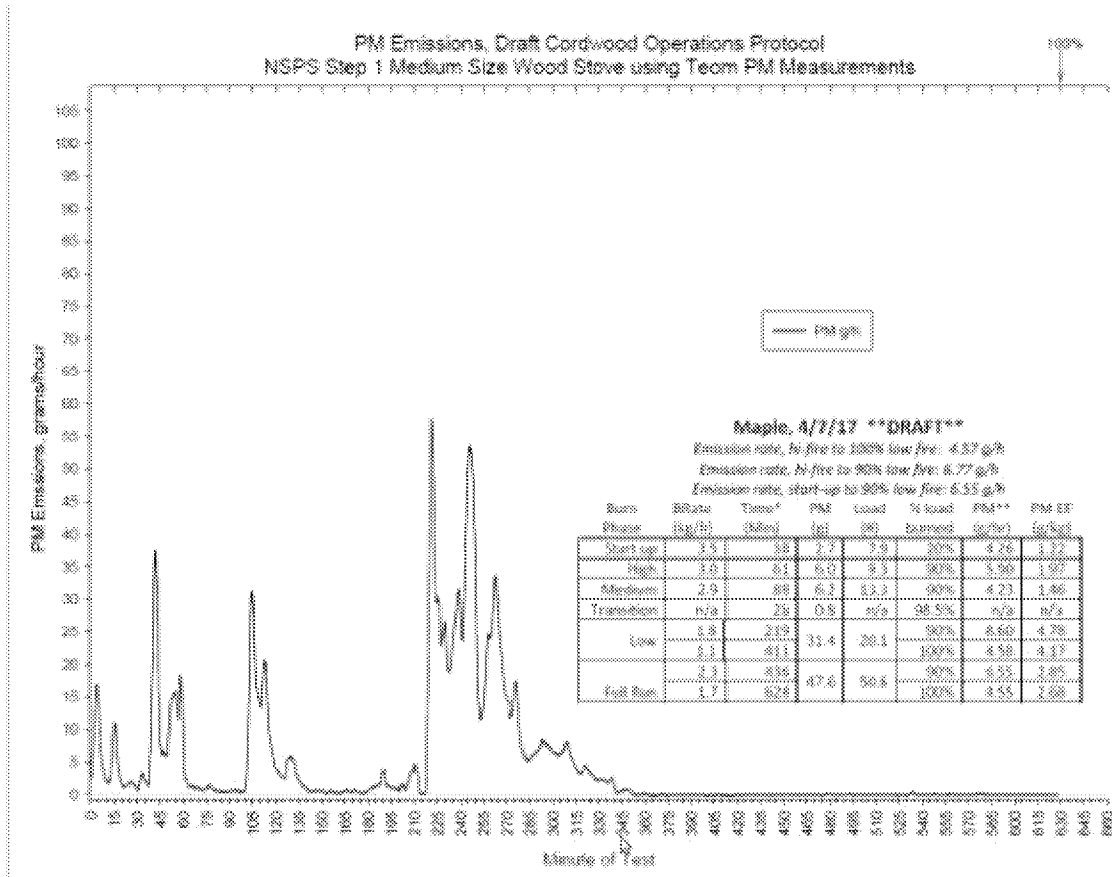
Comparison of Low-Fire Phase

Run Species	Burn Rate (g/kg)	Time (min)	PM (g)	Load (#)	PM (g/hr) @90%	PM EF (g/kg) @90%
M28 Doug Fir	1.55	208	24	15.6	6.92	4.46
	1.33	315	24	15.6	4.57	4.05
4/7 Maple	1.8	219	31.4	20.1	8.60	4.78
	1.1	411	31.4	20.1	4.58	4.17
4/25 Maple	2.0	168	12.8	17.0	4.57	2.29
	1.1	340	12.8	17.0	2.26	2.05
4/26 Maple	1.5	208	32.3	17.7	9.32	6.21
	1.1	321	32.3	17.7	6.04	5.49
4/18 Birch	1.8	223	35.6	20.4	9.58	5.32
	1.1	420	35.6	20.4	5.09	4.62
4/29 Birch	2.0	193	59.8	20.6	18.57	9.30
	1.1	404	59.8	20.6	8.89	8.07
5/4 Birch	1.7	200	17.6	17.7	5.28	3.11
	1.1	342	17.6	17.7	3.09	2.57

- Lisa explained that, at the lowest possible air setting, the stove couldn't maintain a fire; instead it smoked. Lisa noted that she realized that a stove designed to a cordwood standard, would never include an air setting that low. Therefore, Lisa and Mark identified the appropriate air setting for cordwood burning, which was not the lowest possible air setting on the stove. Mark Champion added that, for development purposes, a reliable fire was needed. The stove could have been set lower, but that would have been less reliable. Therefore, Mark and Lisa chose a higher setting for comparison purposes/reliability.
- Lisa noted that the long tail [when burning to 100% consumption] really impacts the g/hr, which is no surprise. Lisa further noted that the g/kg [PM emission factors] are showing wide variability. Lisa remarked that Rod [Tinnemore from Washington State Department of Ecology] really wanted a test that had 3 [replicate] runs, because there is a concern about the addition of new variables and the inherent variability [of burning wood]. Therefore, the idea is to average the 3 runs and Lisa noted that this data will be looked at more in terms of next steps.
- Lisa noted that each test produces a TEOM PM measurement chart [like the one displayed below for the 4/7/17 Maple burn] showing statistics for all the burn phased: start-up, high, medium, transition and the full burn. The statistics shown in the inset table on the graph are burn rate (kg/hr), time (minutes), PM (g), Load (pounds), % of load burned (e.g., 20% for start-up but then

DRAFT June 22, 2017 --- Do not Cite or Distribute

90% to 100% for other phases), PM rate (g/hr) and PM emission factor (EF) (g/kg). A plain TEOM plot is also provided with the tabular data (below), with minutes of test on the x axis and PM emissions in g/hr on the y axis -



- Lisa noted that she is hoping to follow up with this work using NYSEDA funding. Lisa further noted that NESCAUM thinks a compressed day of testing is possible, but she would love to hear potential pitfalls of the one day protocol, and asked the workgroup for their thoughts, questions and discussion.
- John Crouch noted that the challenge is that these will be long days, when taking into account set up, take down, etc.; these will be overtime days [for the lab personnel].
- Lisa noted that she had invited four stove design people to see the protocol in action at Mark Champion's lab – from Jotul, ICC, HHT and Hearthstone Designs – and she is thankful to them for coming by. Lisa explained that these stove designers commented that they normally spend 3 hours preparing a stove [to test] but they liked that, from the start [of the draft Washington protocol], valuable data is actually being obtained, instead of the 3 hours before the current testing protocol [during which no data is collected]. These designers had noted that, under M28, even the high fire testing requires a 5-hour day. Lisa concluded that these designers therefore liked that about this [draft Washington] protocol. But, Lisa agreed with John Crouch, that it's

DRAFT June 22, 2017 --- Do not Cite or Distribute

nonetheless a long day, especially for larger fireboxes. Lisa wondered if it's feasible to perform the testing in one day with a large firebox.

- Bob Lebens noted that, if this test is being repeated 3 times, he would like to know the statistical variability with these results. Lisa noted that the workgroup needs to think about precision versus variability and what devices to look at for precision versus variability. Bob agreed that maybe precision is not the right term, but he would want to know how big the difference is in those 3 [replicate] tests – for example, will people be concerned about the emission standard being so low/small-a-number and is the variability too high compared to that “low” emission standard. Lisa remarked that Bob's is a valid point, but it would be valid for any testing protocol.
- John Crouch wondered if ASTM did some variability testing with Mark Champion. Mark clarified that he did not look at variability specifically.
- Adam Baumgart-Getz noted that Stef Johnson should talk about this and that Bob raised some valid points. Adam further noted that one thing EPA is intrigued by [in the draft Washington protocol] is the existence of the 3 replicate tests. This helps EPA identify the test variability. Adam explained that, regardless of what test method is going through the FRM process, data sharing is an integral part to pin down variability. Therefore, EPA is hoping industry partners will share data. Adam underscored that, regardless of method, that [determining test variability] is a big issue.
- Bob Lebens noted that he appreciated the good work going into this protocol, but the other question/concern he has when looking at a method pertains to confidence that the method is representative [of how consumers use their stoves in the real world]. Getting back to John Crouch's point, that manufacturers will design to the test method, Bob noted this is important.
- Lisa replied that she had spoken about this on the last call, and that NESCAUM had looked at data logger information, what's in M28, what's in ASTM and what's in the field. Lisa noted that one aspect to what's happening in the field [real-world] is that consumers/operators keep reloading their fuel and that reloading is not captured by the current methods. So, [the aim of the draft Washington protocol is to capture] not only how well will the stove burns the first fuel charge, but also how ready the unit is to receive another load. Lisa pointed out that only the overnight burn goes down to nothing [i.e., 100 fuel consumption without re-loading first]. [In the data collected to date] cold starts in the morning are seen, although weekends are different. But, Lisa noted, she tried to capture those operating protocols in this [draft Washington protocol]. Lisa explained that there is a balance of what can be done in one day [testing wise] versus [more ideal] representation. Lisa remarked that she personally feels this [the draft Washington protocol] is much more representative (e.g., to have variation in coal bed weights, demonstrating that the unit lights-off at a 10% coalbed as well as at a 20% coalbed). [The draft Washington protocol includes] different coalbed conditions, as well as different fuel pieces and shapes. Lisa noted that the protocol is not perfect and she is still looking for ideas, but [perfect representation] must be balanced with reasonableness. That is, can it be done?

DRAFT June 22, 2017 --- Do not Cite or Distribute

- John Crouch agreed, noting that it's possible to develop a protocol in which the fire goes out too much; people intervening is more representative. Lisa agreed, noting that the nature of cordwood requires that sometimes the pieces must be adjusted. So, this method allows that and sometimes requires that, Lisa pointed out. John noted that that introduces variability and that's inherent to burning wood. Lisa agreed, noting that she would like to do more than 3 replicates, but an N of 3 is better than 1 and that is why Rod [Tinnemore of Washington State] wanted to go down this pathway. Lisa explained that Rod is on vacation, which is why he was not on the call.
- Lisa remarked to the group that NESCAUM is treating this as a project, that they're heading towards a [cordwood method] protocol and that NESCAUM will be briefing Washington on this. Lisa noted that the question is: Does this workgroup want to go in this direction too, or are there other directions that the workgroup wants to head down?
- John Crouch noted that the industry people are always open to exploring [new approaches], although folks will want to print out and read the protocol more carefully to review it, and there will be questions that need to be discussed.
- Phil Swartzendruber remarked that, from a statistical standpoint, he likes the direction. [The protocol] has a lot of merit for dealing with variability and he would be remiss to see this protocol lost. Phil noted that he's happy Rod Tinnemore proposed this and that it's coming to fruition.
- Lisa noted that the group had come to the end of the meeting's scheduled time.
- John Crouch remarked that there's bound to be some questions and there may need to be some caucusing, assuming states and industry may want to ask questions among themselves first. John suggested that perhaps it would be helpful to have a session where written questions are put up on the screen and the workgroup thinks about answers together. Lisa remarked that she thought that was a great idea and asked workgroup members to dig in and post questions on Basecamp to use as discussion items on the next call.
- John Crouch agreed, noting that the next call may be June 15th and people should chew on data before then.
- Lisa thanked everyone and encouraged anyone to pick up the phone and call her directly with any questions. She will catalog the questions and post them to Basecamp.
- Mark Champion offered to answer any questions too.
- Lisa noted that she and Mark are not holding anything back from the testing results; if they have it, they are willing to share it. Lisa further noted that the protocols are slightly different for some early dates versus the later dates, so workgroup members should ask Lisa and Mark questions about that.
- Lisa and John will touch base about a game plan for the next few weeks. Meeting adjourned.

Message

From: Jill Mozier [jmozier@scainc.com]
Sent: 5/31/2017 1:00:48 AM
To: John Crouch [crouch@hpba.org]; Lisa Rector [lrector@nescaum.org]
CC: Mark Champion [mark@hearthlabsolutions.com]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRIO2]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Graham Fitzsimons [gfitzsimons@scainc.com]
Subject: Re: Draft O/F Workgroup meeting notes from May 4, 2017
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 5-4-2017_revised.docx

You're welcome, John.

I heard back from Mark and he is fine with the screenshots. I did however incorporate a couple edits, upon his suggestion, on page 6.

So, please use the attached revised version, instead of the one I sent last night, when you post to Basecamp.

Thank you,
Jill

Jill Mozier
jmozier@scainc.com
(919) 433-8334
Chapel Hill, North Carolina
<http://www.scainc.com/>

From: John Crouch <crouch@hpba.org>
Sent: Tuesday, May 30, 2017 12:33:25 PM
To: Jill Mozier; Lisa Rector
Cc: Mark Champion; Baumgart-Getz, Adam; Aldridge, Amanda (Aldridge.Amanda@epa.gov); cole.david@epa.gov; Graham Fitzsimons
Subject: RE: Draft O/F Workgroup meeting notes from May 4, 2017

Thanks Jill,
John Crouch

From: Jill Mozier [mailto:jmozier@scainc.com]
Sent: Monday, May 29, 2017 6:55 PM
To: Lisa Rector; John Crouch
Cc: Mark Champion; Baumgart-Getz, Adam; Aldridge, Amanda (Aldridge.Amanda@epa.gov); cole.david@epa.gov; Graham Fitzsimons
Subject: Draft O/F Workgroup meeting notes from May 4, 2017

Lisa and John,

Attached are the draft notes from early May – I apologize for the delay.

EPA is copied as usual on this e-mail and I've also copied Mark Champion, as I've included some screenshots of his spreadsheet (for context in the notes) and I wanted to ensure he and EPA are okay with those screenshots before you post the meeting notes to Basecamp.

Adam and Mark, are you okay with the screenshots included in the attached notes? If not, I can remove them.

Thanks,
Jill

Jill Mozier
Environmental Engineer
(919) 433-8334
Chapel Hill, North Carolina
jmozier@scainc.com
www.scainc.com



DRAFT May 29, 2017 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from May 4, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), Allen Carroll (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Roger Purinton (Jotul), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- Adam Baumgart-Getz from EPA provided a brief overview of the species testing which took place at Mark Champion's lab. The study examined PM emissions and burn rates from different species including Douglas Fir crib, White Pine crib, Red Oak crib and cordwood, Red Maple crib and cordwood, White Birch crib and cordwood, and Ash crib and cordwood. CO emissions were also measured. Study results seem to indicate that species does matter in terms of PM emissions, at least on the pre-1988 stove used in the species study (which had minimal emission control technology). Results also seem to indicate that there is not a big distinction within each species between crib and cordwood. In other words, preliminary review of results suggests that the emission differences between crib and cordwood is minimal within a species, especially compared to differences across/between species. Going forward, EPA is hoping to narrow in on 2 to 3 species and then work on the cordwood-based protocol. EPA hopes the workgroup (WG) will work with the WESTAR and NESCAUM groups on that effort before proposal, in order to inform EPA's proposal.
- It was noted that ASTM also recognized that differences between species in a wide range of specific gravity were potentially large. Therefore, ASTM prescribed a narrow specific gravity range in its cordwood method. Note: ASTM is taking final action on the current ASTM cordwood method. The method should be published within the next 6 weeks.
- It was suggested that the WG needs a face-to-face meeting to make recommendations on where to go directionally with the cordwood method. Conclusions from a core group of people experienced in data review will be presented to the larger WG after a July face-to-face meeting. Albany NY was suggested as the meeting place, with meeting space reserved in NYSERDA, 5

DRAFT May 29, 2017 --- Do not Cite or Distribute

minutes from the airport. The suggested dates for the meeting are: to begin the afternoon of July 19th, followed by a full day on July 20th and finishing up on the morning of July 21st.

- Regarding other ongoing testing, NESCAUM received funding from Washington State a couple years ago and Lisa Rector has been overseeing running ASTM-in-a-day at Mark Champion's lab. The startup, high fire, medium and low fire draft protocol was reviewed in the March WG call. [See March notes.] TEOM results are of specific interest in current testing. Currently, 90% of the fuel is being consumed in this testing, but emissions are dropping off at 85% of the fuel load consumed. Next week (in mid-May) several people will observe the protocol in action at Mark's lab and comments will be collected. NESCAUM, via Mark's testing, is attempting to determine if the ASTM-in-a-day protocol is feasible and has merit with respect to the goals and objectives. Results of the testing to-date will be presented on the June 1st WG call.
- Other trips this summer may be feasible to view the ASTM-in-a-day protocol testing at Mark's lab, for both people experienced with lab testing and wood stove design and for people not as familiar with wood stove design and testing, although separate trips will likely be planned for these two groups.

To-Do List:

- WG members should provide comment and questions on EPA's species testing as well as NESCAUM's ASTM-in-a-day protocol and come prepared for the June 1st meeting by having reviewed data shared to-date.
- Lisa Rector will e-mail people regarding their availability and interest in attending the face-to-face meeting in Albany in July, as well as in visiting Mark Champion's lab to witness wood stove testing under the draft ASTM-in-a-day protocol.
- Lisa Rector will cancel current GoToMeetings and reschedule the WG calls as webinars, in order to allow more people on each call.

Highlights from Meeting:

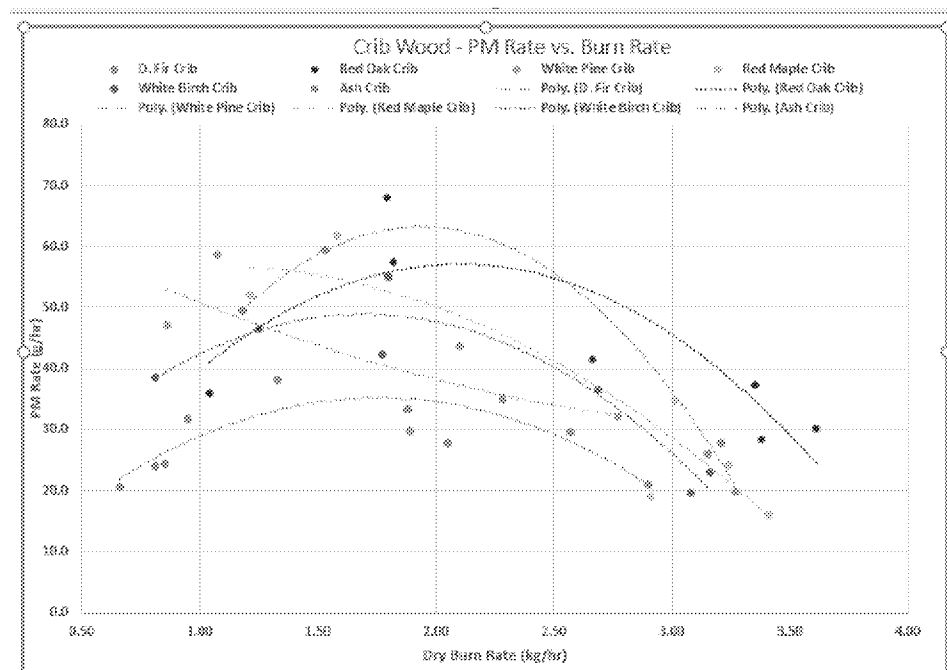
- Before the meeting, Lisa Rector e-mailed four Oak and Ash PM Rate and PM Factor graphs to the workgroup (WG). John Crouch opened the WG meeting, asking everyone to look at the graphs before the meeting started.
- Lisa listed the name of the following people who were on the call, in attendance: Mark Champion, Gaetan Piedalue, Jane Gilbert, John Barnes, Gregg Achman, John Voorhees, Kelli O'Brien, Lisa Herschberger, Randy Orr, Rick Curkeet, Bob Ferguson, Sebastian Button, John Wakefield, George Allen, Rebecca Trojanowski, Tom Morrissey, Adam Baumgart-Getz, Phil Swartzendruber, Cindy Heil, Mike Toney and Jill Mozier.
- Lisa noted that it had been 6 weeks since the WG last met and that she was planning on this meeting being an update call. EPA will provide a brief overview, based on the [Oak and Ash] slides circulated, regarding the species testing at Mark Champion's lab. Lisa noted that she will

DRAFT May 29, 2017 --- Do not Cite or Distribute

provide a brief overview of ASTM-in-a-day being funded by Washington State and also occurring at Mark Champion's lab. Lisa further noted that she will discuss upcoming meetings, including the structure and frequency of calls for the WG. Lisa asked Adam to provide EPA's update of the species testing.

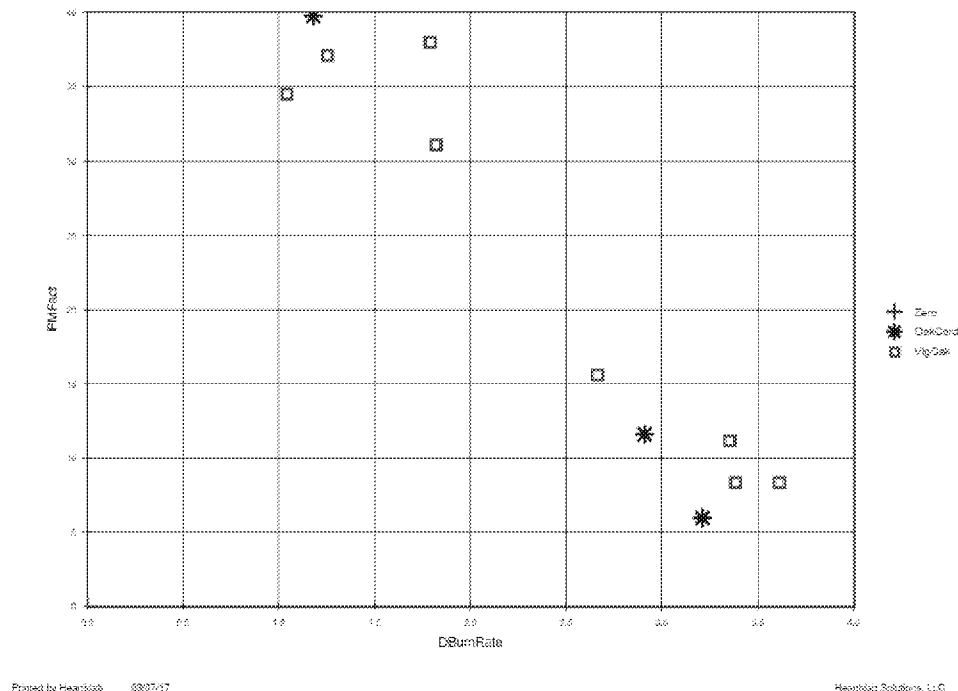
Discussion regarding EPA's Species Testing at Mark Champion's Lab:

- Adam Baumgart-Getz ensured everyone had the Oak and Ash graphs, which had been e-mailed prior to the meeting. Starting with the Ash PM Factor graph, Adam noted that he hoped everyone had a chance to review the spreadsheet that Mark had sent out. Lisa put an image of the spreadsheet on the webcast screen. Adam noted that the study examined [PM emissions and burn rates from] different species [including Douglas Fir crib, White Pine crib, Red Oak crib and cordwood, Red Maple crib and cordwood, White Birch crib and cordwood, and Ash crib and cordwood]. CO emissions were also measured. Adam explained that the group [Hearthlab Solutions, SC&A (formerly EC/R) and EPA] are now doing final QA/QC on the spreadsheet of results. Adam apologized that the process has taken so long.
- Adam explained that the study began by burning crib wood first, since crib wood is used in the current standard. Adam noted that the study produced small data sets, based on a limited number of runs. Nonetheless the study found there were distinct patterns based on species. Some species' results were closer to other species' results, while some were distinct. But, Adam noted that the big take home message from the study is that species does matter ... at least on crib wood on an old Vigilant stove.
- Adam noted that the graph being shown to the teleconference attendees shows the PM g/hr ["PM Rate"] on different species. Adam explained that the graphs reveal a distinct pattern across species. [An example based on crib wood is shown below.]



DRAFT May 29, 2017 --- Do not Cite or Distribute

- The next graph shows crib plus cordwood data together [the PM Factor (g/kg) versus burn rate (kg/hr) for Red Oak], which was one of PDFs sent to the WG prior to the call. In the graph being displayed for the teleconference [shown below for Red Oak], the blue stars are based on cordwood burns/runs and the pink squares on crib runs. Adam concluded that, at least on this pre-1988 Vigilant stove, there is a pattern according to species, but there is not a big distinction within each species between crib and cordwood. The emission difference between crib and cordwood is minimal within a species, especially compared to difference across/between species. Adam suggested that people look at other graphs at leisure.

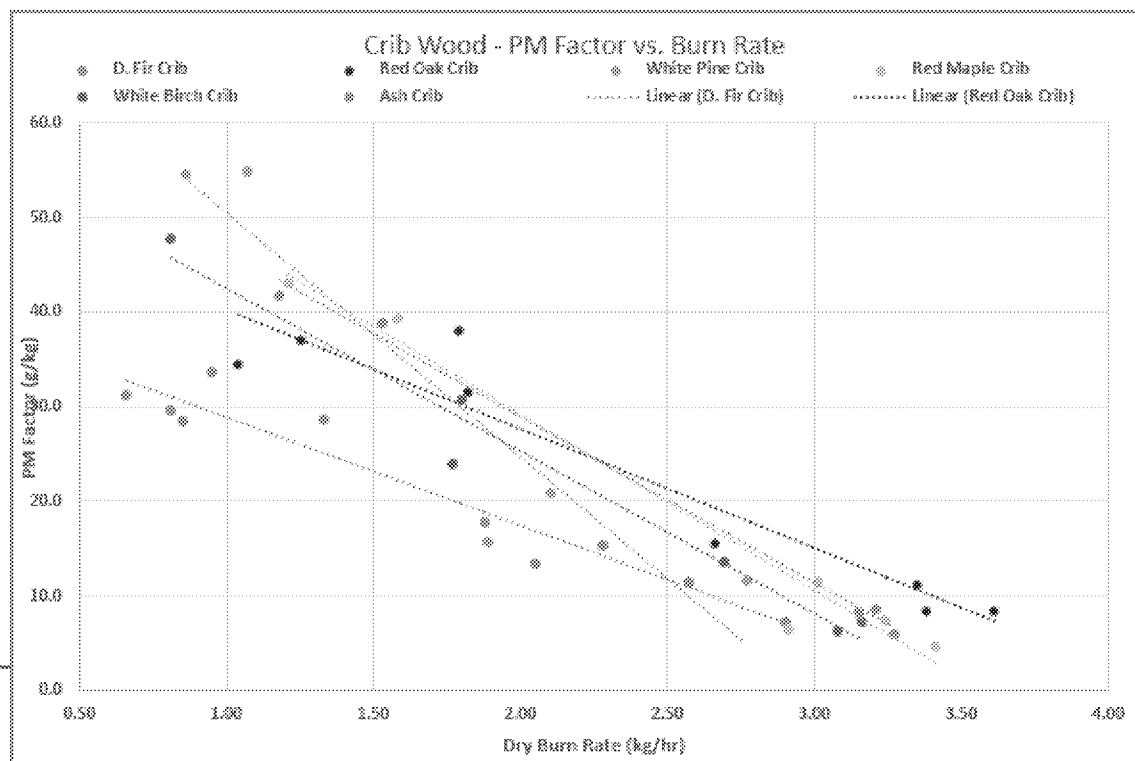


- Adam explained that the Vigilant was chosen in an attempt to test “raw emissions” from a “campfire in a box” as much as possible. Adam noted that the study wasn’t interested in how a modern stove with different control technologies would handle emissions from various species. The goal was to determine what the raw profile for different species is and also to compare crib versus cordwood. Adam explained that EPA, through this study, is trying to build a data bridge from the crib wood standard to a cordwood test.
- Adam noted that EPA knows that not all labs can use Douglas fir cord wood [because it’s not legal to import non-native species in most states]. EPA appreciates the ASTM work, but the Agency had some indication from forestry folks that species would impact emissions. Hence EPA undertook this study, Adam explained.
- Adam explain that, at this point, EPA is hoping to narrow in on 2 to 3 species and then work on the cordwood-based protocol. Adam noted that EPA is hoping people will work with the WESTAR and NESCAUM groups on that effort before proposal. Adam explained that, once EPA

DRAFT May 29, 2017 --- Do not Cite or Distribute

enters the proposal phase, it's very difficult for EPA to work with stakeholder decisions and recommendations directly, as the proposal work occurs behind the veil of EPA.

- Bob Ferguson pointed out that ASTM's premise was not that there is no difference [in emissions] between different species, but rather that there wouldn't be a difference under the very narrow specific gravity range [that ASTM stipulated]. Bob noted that ASTM expected similar results for that narrow range only and emissions on average were the same for two groups of woods. Adam thanked Bob for the clarification and apologized for misspeaking [about ASTM's contentions].
- Adam noted that EPA's species study at Mark Champions' lab did include the specific gravity of wood burned. Adam further noted that White Pine was thrown in there to see what a softwood would look like, but EPA didn't seriously expect White Pine to make it through the process. Adam explained that the species study looked at different species' profiles and everything else was within the range. But the most striking finding was that Douglas Fir was the outlier / most different. Adam noted however that more data needs to be collected on this.
- In response to a question from Bob regarding the g/kg [PM Factor] slide shown below, Adam noted, that there is a lot of similarity but the Douglas fir seems to be different. Adam further noted that the final numbers are on a different tab, which EPA will distribute after final QA/QC.



- Lisa Rector noted that once this spreadsheet is available, it will be posted. George Allen and Lisa will be looking at the spreadsheet closer once they receive a final dataset. Lisa noted to the WG, that she and George would love to get input on other ways to look at the data, to tease other

DRAFT May 29, 2017 --- Do not Cite or Distribute

information from it. Lisa further noted that they would also welcome other datasets. Adam agreed, noting that EPA and HearthLab Solutions have generated this data not as a definitive answer, but as part of a conversation.

- John Crouch noted that he needs to know more what these data points mean, but it's very interesting.
- Mark Champion noted that, based on data provided in the final report, the loading densities can be determined. Mark also pointed out that the specific gravity of each species of wood is listed on the Wood Data tab. [Note: this tab indicates the following average specific gravity measured for each species: Douglas fir = 0.47; Red Oak = 0.69; White Pine = 0.33; Red Maple = 0.50; White Birch = 0.52 and Ash = 0.58].
- Adam noted that Bob Ferguson had made an excellent point about White Pine [being outside the range of specific gravity ASTM recommended] and Adam reiterated that EPA never considered having a White Pine standard. Bob added that ASTM was always concerned about the range of specific gravity. ASTM recognized that differences between species in a wide range of specific gravity were potentially large.
- In response to a question, Mark Champion replied that the damper was closed for the test batches. Bob Ferguson noted that therefore the Vigilant was not close to a campfire, because when the damper is closed, there's a convoluted flow path out to exhaust. Mark agreed, noting that this will be clarified in the final report, so that it's well understood; the test burns in the Vigilant were not that close to a campfire.
- John Crouch asked if the cribs Mark Champion made for the species testing were like those called for by Method 28. Mark replied that they were "M28-like", although were not exact because the loading density was reduced by half. Mark explained that reducing the loading density by half was done to hopefully reduce the effect of boundary conditions, in too large of a fire. Mark explained that there were two 2x4's and two 4x4's in the crib. For the cordwood tests, Mark noted that the study matched volume – that is, the wood took up the same volume with cordwood as the crib occupied in the firebox.
- John Crouch asked if the surface area of the loads was measured. Mark explained that the surface area was not measured, but he took a photo at the end of the load with a ruler, so a reviewer of the data could go back and calculate/estimate the surface area.
- Bob Ferguson reported to the WG that ASTM is taking final action on the current ASTM cordwood method. The method will be off to editors and final formalities at ASTM, so it should be published within the next 6 weeks.
- Bob further noted that the specific density [range] is the same as in the Canadian Standards Association [CSA] method and asked Rick to confirm. Rick Curkeet noted that he would look at the CSA method to be sure, as he thinks that's correct, but he may be wrong.

DRAFT May 29, 2017 --- Do not Cite or Distribute

- Later in the meeting, Bob Ferguson noted that the specific gravity range that ASTM started with (0.6 to 0.73) covered some Oaks and Pine and even Longleaf Pine. Bob noted that some species used by Mark Champion in EPA's species testing is slightly outside of that range. Bob explained that ASTM's range comes from the Forest Service database, and are based on oven-dried wood, which may be different than how Mark determined his specific gravities. Bob noted that the ASTM range originally came from CSA's B415 method, updated for warm air furnaces. Bob concluded that ASTM's range is a narrow range of 0.13 sg.
- Lisa Rector asked people to provide input regarding the species testing results. John Crouch noted he looked forward to a final report as soon as possible.

Discussion regarding proposed face-to-face WG meeting in July in Albany:

- John Crouch discussed the possibility for a July face-to-face WG meeting with a deep data dive, noting that this idea came out of discussion in Albany in December. John noted that he will be in the East in July around the Northeast HPBA affiliate in Albany. John proposed one full day and two half-days of face-to-face WG meetings in Albany in July: that is, the afternoon of July 19th with a full day on the 20th and then finishing up on the morning of July 21st. John explained that the purpose of these meetings is to spread out and look at all the data accumulated to this point, with the expectation that a face-to-face meeting will provide for more intense brainstorming work. John noted that this is how an ASTM subcommittee meeting often works, with lots of in-person robust discussion.
- Lisa Rector noted that she does have meeting space reserved in NYSERDA, which is 5 minutes from the airport, and she also has hotel rooms blocked. Therefore, Lisa requested that people let her know if interested in attending. Lisa noted that, for regulatory folks, this will tack onto something on the Washington State work. People may want to get over to Mark Champion's lab to see some testing. During the next couple weeks Lisa and John will come up with an agenda. Lisa noted that she will provide the WG with a travel agenda soon, which will not be final, but will be final for travel purposes.
- John Crouch noted that the genesis of this meeting is an opportunity to get together and look at data. On the industry side, we are inviting people used to looking at and reviewing data. Likewise, John asked regulatory folks to invite data-oriented people to these July meetings.
- Lisa Rector noted, to put a finer point on it, the WG needs a face-to-face meeting to make recommendations on where to go directionally. The WG needs a sense regarding where the test method should be going, from a core group of folks. Then the conclusions of this core group will be presented to the larger WG after that July meeting. Lisa noted that she and John are hoping it will generate a more robust discussion. John agreed with Lisa's comments.

Discussion regarding ASTM-in-a-day testing at Mark Champion's lab:

- Lisa Rector announced that she wanted to update the WG regarding the status of the Washington State project that NESCAUM is working on. Lisa noted that NESCAUM received

DRAFT May 29, 2017 --- Do not Cite or Distribute

funding from Washington State a couple years ago and have been running ASTM-in-a-day in Mark Champion's lab. Lisa reminded the group that, during the last call in March, she walked through the protocol, including startup and high fire with some modifications and then moving right into the medium and low fires. Lisa noted that the process at Mark's lab included that the first few runs was with different species in a medium box stove then in a larger box stove. The protocol was refined based on those runs and now Mark is performing replicate runs based on 2 different wood species.

- Lisa displayed a mock-up of the chart showing PM emission peaks of startup, high fire, medium and low fires, which also included burn rates, times, amount of wood burned, and type (species) of wood. Lisa explained that the blue line is wood burned. The red line is percent of total PM over the course of the run. Lisa noted that the study is currently at "the top of the funnel" regarding how to perform a one day protocol, that can be run multiple times in order to provide replicate runs. The final dataset, once complete, will be shared with the WG.
- Lisa noted that next week a few folks have been invited to Mark's lab to see this protocol in action during several days of testing. Comments on the protocol are being collected. Lisa noted that they are still trying to understand if this protocol has legs, that is, has merit with respect to the goals/objectives.
- Lisa explained that at this point they are keeping groups small. Lisa noted that Mark Champion will be kept busy for the next year, so that when EPA is looking to move forward with its rulemaking, the data will be available to them. Lisa noted that Mark can allow some folks in lab with advance notice. Later this summer and into the fall, Lisa explained that Mark will be burning under a different funding source and have the ability to bring other folks in to see this protocol.
- Lisa asked the WG if there is interest in early June to dig in and see the results from different runs, how to translate ASTM-in-a-day, and how to correlate back to M28. Phil Swartzendruber noted that he would be interested. Lisa asked if such a discussion should occur as an O/F WG call, noting that the discussion will require the full time available in a meeting call, once the runs are complete. Lisa explained that Mark ran M28-like tests on the stove as well as these ASTM-in-a-day protocols. Mark noted that it was about 20 runs. Lisa reiterated that, once we go through the data and discuss how to modify the protocol, the discussion will take the full time allotment.
- John Crouch opined that such a discussion should happen within this WG, rather than in a side group. The discussion will regard the snapshot of data at that point.
- Lisa noted that she and Mark would be through their QA/QC this week. Lisa further clarified that the black line is realtime PM Lisa is really most interested in the TEOM data. Lisa explained that Mark is burning to 90% [of fuel consumed], but emissions are dropping off at 85% of the fuel load consumed, at least for this stove. Lisa noted that it would be interesting to see data from the medium versus large firebox stove testing overlaid. Lisa requested that WG participants let her know what kind of data they'd like to see.

DRAFT May 29, 2017 --- Do not Cite or Distribute

Discussion regarding upcoming WG meetings in June and July and potential lab visit:

- Lisa noted that she will plan on sharing these results during the first WG call in June, which is the first Thursday in June, June 1st. There was some discussion about having a call on May 18th as well, Lisa noted, and asked the WG if there was interest in the additional call, or if they should wait until June 1st.
- John Crouch replied that one advantage to June 1st is that the WG will be more likely to see final EPA data prior to that date, than prior to May 18th. Therefore, John suggested not having a May 18th meeting, but just having the next call on June 1st. Lisa agreed and noted that the next call is June 1st. Cindy Heil agreed as well.
- John Crouch noted that June 1st will be a data-intensive call and so the WG may want to study up beforehand. Cindy Heil noted that she wasn't able to get into GoToMeeting and would like to see data on that date.
- Lisa noted that she will change to a Webinar format instead of this GoToMeeting format, in order to alleviate the issue of people not being able to join the webcast. Lisa noted that she will therefore cancel and revise invites for joining webcast.
- Lisa noted that she and Mark Champion should touch base, given the timing of the July meeting, to see if people can come to the lab to see the test protocol being run. Mark agreed that he and Lisa should talk, as some things were still up in the air.
- Lisa requested that folks who can travel to Vermont and are interested in Mark's lab let Lisa know, so she and Mark can get a sense of how many people are interested. Mark agreed that judging interest is a good first step.
- John Crouch noted that this visit would be a lab 101 for people who don't have access to a lab and would presumably take place on that Tuesday in July. Lisa agreed, noted that if there are enough beginners, it may be best to combine those people, versus people who are expert in stove design and familiar with labs, etc. John Crouch agreed that the focus should be on people who are not knee-deep in stove design. Lisa agreed that was best for the July meeting, although on another occasion, people who are knee-deep in stove design may wish to visit Mark's lab.
- Lisa will follow-up with an e-mail to which people can answer a few questions, in order to determine who can travel to Albany in July, and also who is interested in heading to Mark's lab to witness some testing.
- Lisa thanked everyone for their attendance and noted that the WG would reconvene on June 1st.
- Meeting adjourned

Message

From: Jill Mozier [jmozier@scainc.com]
Sent: 5/30/2017 1:55:22 AM
To: Lisa Rector [lrector@nescaum.org]; John Crouch [crouch@hpba.org]
CC: Mark Champion [mark@hearthlabsolutions.com]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Graham Fitzsimons [gfitzsimons@scainc.com]
Subject: Draft O/F Workgroup meeting notes from May 4, 2017
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 5-4-2017.docx

Lisa and John,

Attached are the draft notes from early May – I apologize for the delay.

EPA is copied as usual on this e-mail and I've also copied Mark Champion, as I've included some screenshots of his spreadsheet (for context in the notes) and I wanted to ensure he and EPA are okay with those screenshots before you post the meeting notes to Basecamp.

Adam and Mark, are you okay with the screenshots included in the attached notes? If not, I can remove them.

Thanks,
Jill

Jill Mozier
Environmental Engineer
(919) 433-8334
Chapel Hill, North Carolina
jmozier@scainc.com
www.scainc.com



DRAFT May 29, 2017 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from May 4, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), Allen Carroll (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Roger Purinton (Jotul), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- Adam Baumgart-Getz from EPA provided a brief overview of the species testing which took place at Mark Champion's lab. The study examined PM emissions and burn rates from different species including Douglas Fir crib, White Pine crib, Red Oak crib and cordwood, Red Maple crib and cordwood, White Birch crib and cordwood, and Ash crib and cordwood. CO emissions were also measured. Study results seem to indicate that species does matter in terms of PM emissions, at least on the pre-1988 stove used in the species study (which had minimal emission control technology). Results also seem to indicate that there is not a big distinction within each species between crib and cordwood. In other words, preliminary review of results suggests that the emission differences between crib and cordwood is minimal within a species, especially compared to differences across/between species. Going forward, EPA is hoping to narrow in on 2 to 3 species and then work on the cordwood-based protocol. EPA hopes the workgroup (WG) will work with the WESTAR and NESCAUM groups on that effort before proposal, in order to inform EPA's proposal.
- It was noted that ASTM also recognized that differences between species in a wide range of specific gravity were potentially large. Therefore, ASTM prescribed a narrow specific gravity range in its cordwood method. Note: ASTM is taking final action on the current ASTM cordwood method. The method should be published within the next 6 weeks.
- It was suggested that the WG needs a face-to-face meeting to make recommendations on where to go directionally with the cordwood method. Conclusions from a core group of people experienced in data review will be presented to the larger WG after a July face-to-face meeting. Albany NY was suggested as the meeting place, with meeting space reserved in NYSERDA, 5

DRAFT May 29, 2017 --- Do not Cite or Distribute

minutes from the airport. The suggested dates for the meeting are: to begin the afternoon of July 19th, followed by a full day on July 20th and finishing up on the morning of July 21st.

- Regarding other ongoing testing, NESCAUM received funding from Washington State a couple years ago and Lisa Rector has been overseeing running ASTM-in-a-day at Mark Champion's lab. The startup, high fire, medium and low fire draft protocol was reviewed in the March WG call. [See March notes.] TEOM results are of specific interest in current testing. Currently, 90% of the fuel is being consumed in this testing, but emissions are dropping off at 85% of the fuel load consumed. Next week (in mid-May) several people will observe the protocol in action at Mark's lab and comments will be collected. NESCAUM, via Mark's testing, is attempting to determine if the ASTM-in-a-day protocol is feasible and has merit with respect to the goals and objectives. Results of the testing to-date will be presented on the June 1st WG call.
- Other trips this summer may be feasible to view the ASTM-in-a-day protocol testing at Mark's lab, for both people experienced with lab testing and wood stove design and for people not as familiar with wood stove design and testing, although separate trips will likely be planned for these two groups.

To-Do List:

- WG members should provide comment and questions on EPA's species testing as well as NESCAUM's ASTM-in-a-day protocol and come prepared for the June 1st meeting by having reviewed data shared to-date.
- Lisa Rector will e-mail people regarding their availability and interest in attending the face-to-face meeting in Albany in July, as well as in visiting Mark Champion's lab to witness wood stove testing under the draft ASTM-in-a-day protocol.
- Lisa Rector will cancel current GoToMeetings and reschedule the WG calls as webinars, in order to allow more people on each call.

Highlights from Meeting:

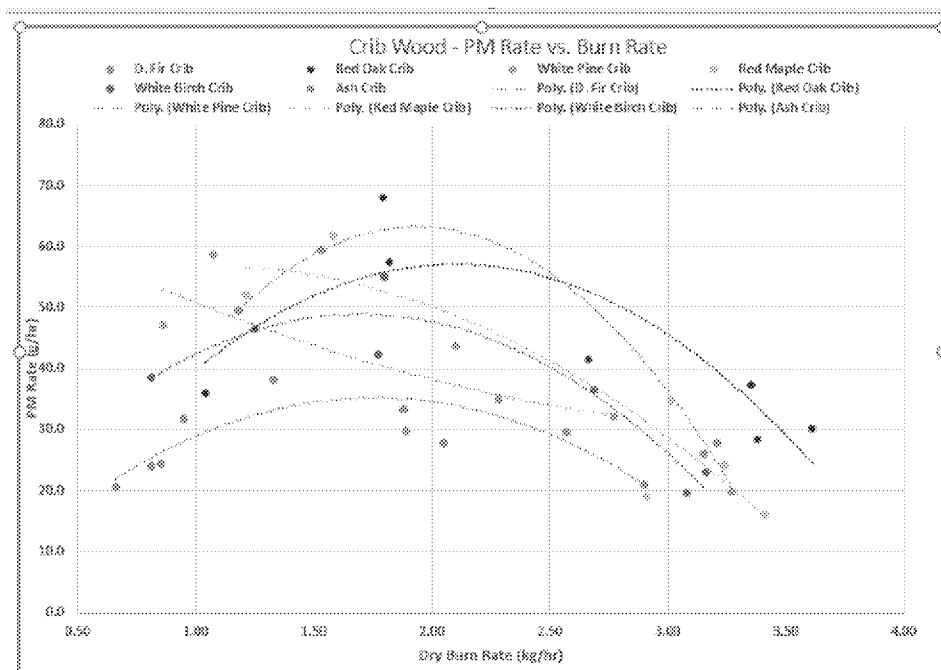
- Before the meeting, Lisa Rector e-mailed four Oak and Ash PM Rate and PM Factor graphs to the workgroup (WG). John Crouch opened the WG meeting, asking everyone to look at the graphs before the meeting started.
- Lisa listed the name of the following people who were on the call, in attendance: Mark Champion, Gaetan Piedalue, Jane Gilbert, John Barnes, Gregg Achman, John Voorhees, Kelli O'Brien, Lisa Herschberger, Randy Orr, Rick Curkeet, Bob Ferguson, Sebastian Button, John Wakefield, George Allen, Rebecca Trojanowski, Tom Morrissey, Adam Baumgart-Getz, Phil Swartzendruber, Cindy Heil, Mike Toney and Jill Mozier.
- Lisa noted that it had been 6 weeks since the WG last met and that she was planning on this meeting being an update call. EPA will provide a brief overview, based on the [Oak and Ash] slides circulated, regarding the species testing at Mark Champion's lab. Lisa noted that she will

DRAFT May 29, 2017 --- Do not Cite or Distribute

provide a brief overview of ASTM-in-a-day being funded by Washington State and also occurring at Mark Champion's lab. Lisa further noted that she will discuss upcoming meetings, including the structure and frequency of calls for the WG. Lisa asked Adam to provide EPA's update of the species testing.

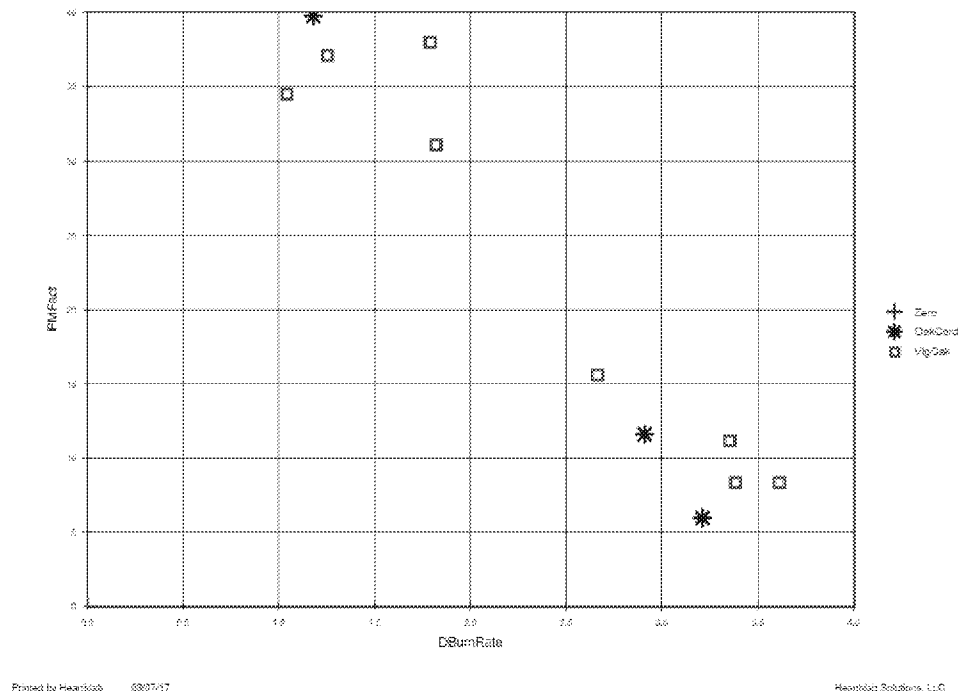
Discussion regarding EPA's Species Testing at Mark Champion's Lab:

- Adam Baumgart-Getz ensured everyone had the Oak and Ash graphs, which had been e-mailed prior to the meeting. Starting with the Ash PM Factor graph, Adam noted that he hoped everyone had a chance to review the spreadsheet that Mark had sent out. Lisa put an image of the spreadsheet on the webcast screen. Adam noted that the study examined [PM emissions and burn rates from] different species [including Douglas Fir crib, White Pine crib, Red Oak crib and cordwood, Red Maple crib and cordwood, White Birch crib and cordwood, and Ash crib and cordwood]. CO emissions were also measured. Adam explained that the group [Hearthlab Solutions, SC&A (formerly EC/R) and EPA] are now doing final QA/QC on the spreadsheet of results. Adam apologized that the process has taken so long.
- Adam explained that the study began by burning crib wood first, since crib wood is used in the current standard. Adam noted that the study produced small data sets, based on a limited number of runs. Nonetheless the study found there were distinct patterns based on species. Some species' results were closer to other species' results, while some were distinct. But, Adam noted that the big take home message from the study is that species does matter ... at least on crib wood on an old Vigilant stove.
- Adam noted that the graph being shown to the teleconference attendees shows the PM g/hr ["PM Rate"] on different species. Adam explained that the graphs reveal a distinct pattern across species. [An example based on crib wood is shown below.]



DRAFT May 29, 2017 --- Do not Cite or Distribute

- The next graph shows crib plus cordwood data together [the PM Factor (g/kg) versus burn rate (kg/hr) for Red Oak], which was one of PDFs sent to the WG prior to the call. In the graph being displayed for the teleconference [shown below for Red Oak], the blue stars are based on cordwood burns/runs and the pink squares on crib runs. Adam concluded that, at least on this pre-1988 Vigilant stove, there is a pattern according to species, but there is not a big distinction within each species between crib and cordwood. The emission difference between crib and cordwood is minimal within a species, especially compared to difference across/between species. Adam suggested that people look at other graphs at leisure.

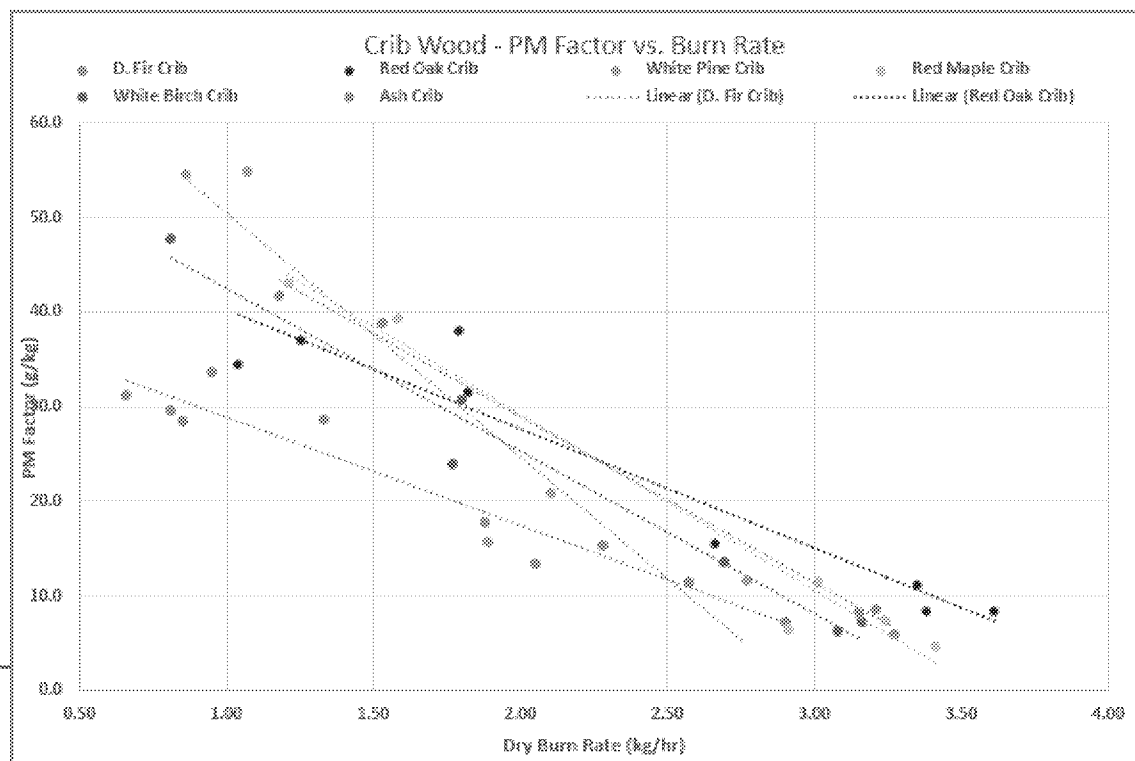


- Adam explained that the Vigilant was chosen in an attempt to test “raw emissions” from a “campfire in a box” as much as possible. Adam noted that the study wasn’t interested in how a modern stove with different control technologies would handle emissions from various species. The goal was to determine what the raw profile for different species is and also to compare crib versus cordwood. Adam explained that EPA, through this study, is trying to build a data bridge from the crib wood standard to a cordwood test.
- Adam noted that EPA knows that not all labs can use Douglas fir cord wood [because it’s not legal to import non-native species in most states]. EPA appreciates the ASTM work, but the Agency had some indication from forestry folks that species would impact emissions. Hence EPA undertook this study, Adam explained.
- Adam explain that, at this point, EPA is hoping to narrow in on 2 to 3 species and then work on the cordwood-based protocol. Adam noted that EPA is hoping people will work with the WESTAR and NESCAUM groups on that effort before proposal. Adam explained that, once EPA

DRAFT May 29, 2017 --- Do not Cite or Distribute

enters the proposal phase, it's very difficult for EPA to work with stakeholder decisions and recommendations directly, as the proposal work occurs behind the veil of EPA.

- Bob Ferguson pointed out that ASTM's premise was not that there is no difference [in emissions] between different species, but rather that there wouldn't be a difference under the very narrow specific gravity range [that ASTM stipulated]. Bob noted that ASTM expected similar results for that narrow range only and emissions on average were the same for two groups of woods. Adam thanked Bob for the clarification and apologized for misspeaking [about ASTM's contentions].
- Adam noted that EPA's species study at Mark Champions' lab did include the specific gravity of wood burned. Adam further noted that White Pine was thrown in there to see what a softwood would look like, but EPA didn't seriously expect White Pine to make it through the process. Adam explained that the species study looked at different species' profiles and everything else was within the range. But the most striking finding was that Douglas Fir was the outlier / most different. Adam noted however that more data needs to be collected on this.
- In response to a question from Bob regarding the g/kg [PM Factor] slide shown below, Adam noted, that there is a lot of similarity but the Douglas fir seems to be different. Adam further noted that the final numbers are on a different tab, which EPA will distribute after final QA/QC.



- Lisa Rector noted that once this spreadsheet is available, it will be posted. George Allen and Lisa will be looking at the spreadsheet closer once they receive a final dataset. Lisa noted to the WG, that she and George would love to get input on other ways to look at the data, to tease other

DRAFT May 29, 2017 --- Do not Cite or Distribute

information from it. Lisa further noted that they would also welcome other datasets. Adam agreed, noting that EPA and HearthLab Solutions have generated this data not as a definitive answer, but as part of a conversation.

- John Crouch noted that he needs to know more what these data points mean, but it's very interesting.
- Mark Champion noted that, in the final report, the loading densities will be provided. Mark also pointed out that the specific gravity of each species of wood is listed on the Wood Data tab. [Note: this tab indicates the following average specific gravity measured for each species: Douglas fir = 0.47; Red Oak = 0.69; White Pine = 0.33; Red Maple = 0.50; White Birch = 0.52 and Ash = 0.58].
- Adam noted that Bob Ferguson had made an excellent point about White Pine [being outside the range of specific gravity ASTM recommended] and Adam reiterated that EPA never considered having a White Pine standard. Bob added that ASTM was always concerned about the range of specific gravity. ASTM recognized that differences between species in a wide range of specific gravity were potentially large.
- In response to a question, Mark Champion replied that the damper was closed for the test batches. Bob Ferguson noted that therefore the Vigilant was not close to a campfire, because when the damper is closed, there's a convoluted flow path out to exhaust. Mark agreed, noting that this will be clarified in the final report, so that it's well understood; the test burns in the Vigilant were not that close to a campfire.
- John Crouch asked if the cribs Mark Champion made for the species testing were like those called for by Method 28. Mark replied that they were "M28-like", although were not exact because the loading density was reduced by half. Mark explained that reducing the loading density by half was done to hopefully reduce the effect of boundary conditions, in too large of a fire. Mark explained that there were two 2x4's and two 4x4's in the crib. For the cordwood tests, Mark noted that the study matched volume – that is, the wood took up the same volume with cordwood as the crib occupied in the firebox.
- John Crouch asked if the surface area of the loads was measured. Mark explained that the surface area was not measured, but he took a photo at the end of the load with a ruler, so he could go back and calculate/estimate the surface area.
- Bob Ferguson reported to the WG that ASTM is taking final action on the current ASTM cordwood method. The method will be off to editors and final formalities at ASTM, so it should be published within the next 6 weeks.
- Bob further noted that the specific density [range] is the same as in the Canadian Standards Association [CSA] method and asked Rick to confirm. Rick Curkeet noted that he would look at the CSA method to be sure, as he thinks that's correct, but he may be wrong.

DRAFT May 29, 2017 --- Do not Cite or Distribute

- Later in the meeting, Bob Ferguson noted that the specific gravity range that ASTM started with (0.6 to 0.73) covered some Oaks and Pine and even Longleaf Pine. Bob noted that some species used by Mark Champion in EPA's species testing is slightly outside of that range. Bob explained that ASTM's range comes from the Forest Service database, and are based on oven-dried wood, which may be different than how Mark determined his specific gravities. Bob noted that the ASTM range originally came from CSA's B415 method, updated for warm air furnaces. Bob concluded that ASTM's range is a narrow range of 0.13 sg.
- Lisa Rector asked people to provide input regarding the species testing results. John Crouch noted he looked forward to a final report as soon as possible.

Discussion regarding proposed face-to-face WG meeting in July in Albany:

- John Crouch discussed the possibility for a July face-to-face WG meeting with a deep data dive, noting that this idea came out of discussion in Albany in December. John noted that he will be in the East in July around the Northeast HPBA affiliate in Albany. John proposed one full day and two half-days of face-to-face WG meetings in Albany in July: that is, the afternoon of July 19th with a full day on the 20th and then finishing up on the morning of July 21st. John explained that the purpose of these meetings is to spread out and look at all the data accumulated to this point, with the expectation that a face-to-face meeting will provide for more intense brainstorming work. John noted that this is how an ASTM subcommittee meeting often works, with lots of in-person robust discussion.
- Lisa Rector noted that she does have meeting space reserved in NYSERDA, which is 5 minutes from the airport, and she also has hotel rooms blocked. Therefore, Lisa requested that people let her know if interested in attending. Lisa noted that, for regulatory folks, this will tack onto something on the Washington State work. People may want to get over to Mark Champion's lab to see some testing. During the next couple weeks Lisa and John will come up with an agenda. Lisa noted that she will provide the WG with a travel agenda soon, which will not be final, but will be final for travel purposes.
- John Crouch noted that the genesis of this meeting is an opportunity to get together and look at data. On the industry side, we are inviting people used to looking at and reviewing data. Likewise, John asked regulatory folks to invite data-oriented people to these July meetings.
- Lisa Rector noted, to put a finer point on it, the WG needs a face-to-face meeting to make recommendations on where to go directionally. The WG needs a sense regarding where the test method should be going, from a core group of folks. Then the conclusions of this core group will be presented to the larger WG after that July meeting. Lisa noted that she and John are hoping it will generate a more robust discussion. John agreed with Lisa's comments.

Discussion regarding ASTM-in-a-day testing at Mark Champion's lab:

- Lisa Rector announced that she wanted to update the WG regarding the status of the Washington State project that NESCAUM is working on. Lisa noted that NESCAUM received

DRAFT May 29, 2017 --- Do not Cite or Distribute

funding from Washington State a couple years ago and have been running ASTM-in-a-day in Mark Champion's lab. Lisa reminded the group that, during the last call in March, she walked through the protocol, including startup and high fire with some modifications and then moving right into the medium and low fires. Lisa noted that the process at Mark's lab included that the first few runs was with different species in a medium box stove then in a larger box stove. The protocol was refined based on those runs and now Mark is performing replicate runs based on 2 different wood species.

- Lisa displayed a mock-up of the chart showing PM emission peaks of startup, high fire, medium and low fires, which also included burn rates, times, amount of wood burned, and type (species) of wood. Lisa explained that the blue line is wood burned. The red line is percent of total PM over the course of the run. Lisa noted that the study is currently at "the top of the funnel" regarding how to perform a one day protocol, that can be run multiple times in order to provide replicate runs. The final dataset, once complete, will be shared with the WG.
- Lisa noted that next week a few folks have been invited to Mark's lab to see this protocol in action during several days of testing. Comments on the protocol are being collected. Lisa noted that they are still trying to understand if this protocol has legs, that is, has merit with respect to the goals/objectives.
- Lisa explained that at this point they are keeping groups small. Lisa noted that Mark Champion will be kept busy for the next year, so that when EPA is looking to move forward with its rulemaking, the data will be available to them. Lisa noted that Mark can allow some folks in lab with advance notice. Later this summer and into the fall, Lisa explained that Mark will be burning under a different funding source and have the ability to bring other folks in to see this protocol.
- Lisa asked the WG if there is interest in early June to dig in and see the results from different runs, how to translate ASTM-in-a-day, and how to correlate back to M28. Phil Swartzendruber noted that he would be interested. Lisa asked if such a discussion should occur as an O/F WG call, noting that the discussion will require the full time available in a meeting call, once the runs are complete. Lisa explained that Mark ran M28-like tests on the stove as well as these ASTM-in-a-day protocols. Mark noted that it was about 20 runs. Lisa reiterated that, once we go through the data and discuss how to modify the protocol, the discussion will take the full time allotment.
- John Crouch opined that such a discussion should happen within this WG, rather than in a side group. The discussion will regard the snapshot of data at that point.
- Lisa noted that she and Mark would be through their QA/QC this week. Lisa further clarified that the black line is realtime PM Lisa is really most interested in the TEOM data. Lisa explained that Mark is burning to 90% [of fuel consumed], but emissions are dropping off at 85% of the fuel load consumed, at least for this stove. Lisa noted that it would be interesting to see data from the medium versus large firebox stove testing overlaid. Lisa requested that WG participants let her know what kind of data they'd like to see.

DRAFT May 29, 2017 --- Do not Cite or Distribute

Discussion regarding upcoming WG meetings in June and July and potential lab visit:

- Lisa noted that she will plan on sharing these results during the first WG call in June, which is the first Thursday in June, June 1st. There was some discussion about having a call on May 18th as well, Lisa noted, and asked the WG if there was interest in the additional call, or if they should wait until June 1st.
- John Crouch replied that one advantage to June 1st is that the WG will be more likely to see final EPA data prior to that date, than prior to May 18th. Therefore, John suggested not having a May 18th meeting, but just having the next call on June 1st. Lisa agreed and noted that the next call is June 1st. Cindy Heil agreed as well.
- John Crouch noted that June 1st will be a data-intensive call and so the WG may want to study up beforehand. Cindy Heil noted that she wasn't able to get into GoToMeeting and would like to see data on that date.
- Lisa noted that she will change to a Webinar format instead of this GoToMeeting format, in order to alleviate the issue of people not being able to join the webcast. Lisa noted that she will therefore cancel and revise invites for joining webcast.
- Lisa noted that she and Mark Champion should touch base, given the timing of the July meeting, to see if people can come to the lab to see the test protocol being run. Mark agreed that he and Lisa should talk, as some things were still up in the air.
- Lisa requested that folks who can travel to Vermont and are interested in Mark's lab let Lisa know, so she and Mark can get a sense of how many people are interested. Mark agreed that judging interest is a good first step.
- John Crouch noted that this visit would be a lab 101 for people who don't have access to a lab and would presumably take place on that Tuesday in July. Lisa agreed, noted that if there are enough beginners, it may be best to combine those people, versus people who are expert in stove design and familiar with labs, etc. John Crouch agreed that the focus should be on people who are not knee-deep in stove design. Lisa agreed that was best for the July meeting, although on another occasion, people who are knee-deep in stove design may wish to visit Mark's lab.
- Lisa will follow-up with an e-mail to which people can answer a few questions, in order to determine who can travel to Albany in July, and also who is interested in heading to Mark's lab to witness some testing.
- Lisa thanked everyone for their attendance and noted that the WG would reconvene on June 1st.
- Meeting adjourned

Message


From: Jill Mozier [jmozier@scainc.com]
Sent: 4/7/2017 5:45:04 PM
To: Lisa Rector [lrector@nescaum.org]; John Crouch [crouch@hpba.org]
CC: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]; Graham Fitzsimons [gfitzsimons@scainc.com]
Subject: Draft O/F Workgroup Meeting Notes from March 23, 2017
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 3-23-2017.docx

Lisa and John,

Attached are the draft meeting notes from March 23rd.

Lisa, please note my change in e-mail address, which may require a new invite to the O/F and Steering Committee Basecamps.

Thank you,
Jill

Jill Mozier
jmozier@scainc.com
(919) 433-8334
Chapel Hill, North Carolina
 <http://www.scainc.com/>

DRAFT April 7, 2017 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from March 23, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), Allen Carroll (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Roger Purinton (Jotul), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- Assuming the new meeting day and time works for everyone, the workgroup (WG) meetings will likely be switched to every-other-Friday at 1 pm. This decision is not yet final.
- The EPA-funded species testing by Mark Champion has finished and results will be forthcoming as soon as the data spreadsheet is finalized.
- The draft 1-day integrated run testing protocol (a.k.a. "ASTM-in-a-day") was presented to the WG. Testing under a more finalized version of this protocol will be performed by Mark Champion under a project managed by Lisa Rector. The 1-day protocol compresses all 4 phases of ASTM's test into a single day's run and includes Start-up, followed by the High Fire phase, followed by the Medium Fire phase and ending with the Low Fire phase. Equivalency factors would be applied to correlate the 1-day test results back to the compliance standard in place under the NSPS.
- Trial loading densities used for each phase were 1 lb/ft for kindling, 3 lb/ft for start-up, 5 lb/ft for high fire, 5 lb/ft for medium fire, and as much fuel will fit in the firebox for the low fire. It was noted that the loading densities for the start-up and perhaps the kindling phases may be too low/small.
- Regarding piece size, WG members seemed to agree that it was reasonable for the protocol to call for small pieces for the High Fire load, medium to large pieces for the Medium Fire load and a jigsaw size mixture of small, medium and large pieces for the Low Fire load (i.e., as much as would fit in the firebox for the Low Fire).

DRAFT April 7, 2017 --- Do not Cite or Distribute

- Air settings were set fully open for start-up and the high fire phase, at medium open for the medium phase and at the lowest air settings for the low-fire phase. It was noted that, when burning cordwood, the low air settings on a stove designed to crib wood may be too low, as cordwood burns at a lower burn rate at a given air setting (compared to crib wood) and therefore more air may be required at the low burn for cordwood.
- The end of the low fire test is tentatively defined as 90% fuel consumption or no weight change after 30 minutes. WG members expressed support for defining the end of ASTM-in-a-day's high and medium fire phases in terms of percentage of coal bed burned down, instead of in rigid timeframes (e.g., 1- and 2-hour burn requirements), in order that the protocol be as flexible as possible to work for a wide range of stoves without requiring exceptions or allowing loopholes.

To-Do List:

- Lisa Rector will e-mail everyone about upcoming meeting days and times.
- Lisa will post to Basecamp PDFs and eventually a spreadsheet of data from EPA's crib and cordwood species testing performed by Mark Champion. WG members should review the data and provide input to Lisa and to EPA.
- Lisa will post to Basecamp her slides regarding the 1-day integrated run "ASTM-in-a-day" protocol she's working on via testing by Mark Champion and will also eventually post photos.

Highlights from Meeting:

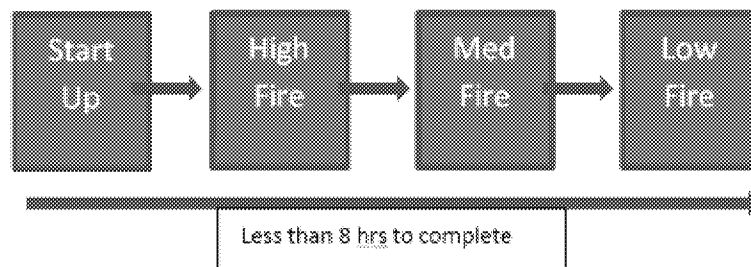
- Lisa Rector opened the workgroup (WG) meeting, noting that John Crouch, Bob Lebens, Adam Baumgart-Getz, Amanda Aldridge and Cindy Heil couldn't join the call. Lisa also noted that many lab folks appeared to be missing from the call. The following WG participants were present on the call: Lisa Rector, Kelli O'Brien, Gregg Achman, John Barnes, Stef Johnson, Lisa Herschberger, Randy Orr, Rick Curkeet, Bob Ferguson, Rod Tinnemore, John Wakefield, Roger Purinton, Tom Butcher, Jill Mozier plus others who joined later or did not identify themselves.
- Lisa's webinar slide showed the agenda for the day to be: the [upcoming] call schedule; a brief overview of EPA's work; and a review discussion of the 1-day protocol.
- Regarding scheduling of future meetings, Lisa noted that neither she nor John Crouch are available for the two regular April meetings and that Thursdays in general were problematic. Lisa therefore suggested Fridays at 1 pm and asked if anyone had problems with that day and time. Lisa Herschberger replied she will have problems some of time with Fridays at 1pm. Lisa Rector and Lisa Herschberger will talk one-on-one regarding a work-around.
- Lisa Rector noted that she has not yet posted data from the EPA-funded species testing that Mark Champion did. Mark has finished that testing and Lisa will post PDFs of the White Birch, Red Maple and Red Oak runs to Basecamp. Mark is currently cleaning-up and finalizing his Excel spreadsheet of data and other testing information and that too will be posted, once cleaned up. Lisa asked WG members to review the postings on the species testing. Lisa noted that EPA

DRAFT April 7, 2017 --- Do not Cite or Distribute

welcomes WG members' input after they dig into the data. Lisa also noted that, probably on the next call, EPA will present some of that information.

- Lisa recapped that the WG was starting to get into the definition of burn rates [on the last call]. Lisa suggested that laying out what an alternative protocol may look like could aid the discussion. To that end, Lisa noted that during today's meeting, she will go over the testing work she's doing with Mark Champion, in order to show the WG what one alternative protocol looks like. Lisa asked if there were any other items for discussion, but the group had none.
- Regarding the 1-day protocol, Lisa explained that she [NESCAUM] is trying to develop an integrated run, which builds on the ASTM method as well as the TEOM data being collected in a multitude of labs. **The 1-day protocol compresses all 4 phases of ASTM's test into a single day's run** (i.e., "**ASTM-in-a-day**"). The run consists of multiple burn rates and loading weights and doesn't burn the fuel charge down to 0 weight. Lisa clarified that the NSPS's 2 g/hr (cordwood limit) or 2.5 g/hr (crib limit) would not apply directly to the results of this 1-day test, but rather equivalency factors would be applied to correlate the 1-day test results back to the compliance standard in place under the NSPS. Rod Tinnemore asked the meaning of the 2 and 2.5 g/hr and Lisa replied that 2 g/hr refers to the NSPS' Step 2 [2020 limit] using crib and 2.5 g/hr refers to the Step 2 [2020 limit] using cordwood. Below is an overview of the integrated run:

Overview of Integrated Run



- Multiple burn rates
 - Multiple loading events
 - Does not burn to zero weight
 - Equivalency factors **MUST** be developed
- Lisa noted that she was at Mark Champion's lab yesterday, testing to determine what aspects of the protocol are doable and not doable. Lisa noted that she has questions about some parts of her draft protocol, but would like to run through it first for the WG and then come back to seek input and answer questions.
 - Lisa noted that the first piece is the **Start-up Phase**. Mark had Lisa build a fire like she would have at home and then translated those loads into loading densities. Air settings were fully open. Lisa used 6 pieces of crumpled newspaper then loaded small, dry kindling on top of that.

DRAFT April 7, 2017 --- Do not Cite or Distribute

Lisa used the same species for kindling as used in the load. The kindling load resulted in a loading density of 1 lb/cubic foot. The starter load fuel was placed on top of the kindling. Lisa noted that they started with 2 lb/cubic foot but, about 15 minutes into the burn, Lisa noted that she wanted to add more fuel. Therefore, Lisa and Mark decided to increase the density to 3 lb/cubic foot, whether all at once or at any interval during the startup phase. Regarding the parameters for the door and poking/stirring, the door can be open for 5 minutes and poking/stirring is unlimited during startup (the cold start run). Lisa noted that the end of the start-up phase is currently defined as when the coal bed reaches 15% of the high fire fuel charge. [Note: this is cut-off in the below screenshot.]

Start Up Phase

- Set air settings fully open
 - Startup load
 - Crumple newspaper
 - Load kindling - log cabin style for this test
 - Loading density: 1 lb per cubic foot for dry kindling
 - Species and Size: no restrictions
 - Load starter fuel: all starter fuel can be added at once or added at any interval
 - Loading density: 3 lb per cubic foot
 - Size: ~2 inch round cross sectional equivalent
 - Start fire
 - Door can be open for up to 5 minutes
 - Unlimited poking and stirring during cold start run
 - End of start-up phase d
- Next, is the **High Fire Phase**. Below is a photo of the load used for the high fire phase. Because the load is not being burned down to 0 in this protocol, half of ASTM's 10 lb/cubic foot was used (5 lb/cubic foot). Lisa explained that another load would not fit in the stove, if 10 lb/cubic foot had been used as the starting load, since it is only being burned down to 50%. For the high fire phase, Lisa and Mark used 3 pieces of wood and closed the door immediately. No stirring or poking is allowed during the 1-hour high fire. Lisa requested feedback on whether small or large wood pieces should be used and how the high fire should be defined.
 - Lisa noted that the proposed protocol is high fire for only 1 hour. Part of the reasoning for the 1-hour burn is that TEOM data (showing real-time PM) reveals that 90% of the PM is captured in the first 45 minutes. Therefore, sampling really only needs to be performed for 1 hour, according to Lisa. Lisa underscored however that an equivalency factor will need to be figured out to translate back to burning down to 0%, as done in Method 28.

DRAFT April 7, 2017 --- Do not Cite or Distribute

High Fire Phase

- Open door and load high fire load
 - Loading density: 5lb per cubic ft
 - Size: TBD
 - Questions - small or large pieces
- Door closed immediately
- No stirring or poking
- Test ends at after one hour from loading



- Next, is the **Medium Fire Phase**. Lisa noted that, for the medium fire phase, the wood is loaded in the firebox at 5 lb/cubic foot. This is the same density as the high fire, so the resulting volume is little less than 10 lb/cubic foot, because wood from the high fire is left in the firebox in addition. Lisa explained that, even though a lot burned during the high fire phase, all of the wood did not go down into coals; there are still chunks. Lisa also noted that she had questions for the WG about the proper piece sizes for the medium fire. Below is Lisa's slide for the Medium Fire Phase.

Medium Fire Phase

- Open door and load medium fire load
 - Loading density: 5lb per cubic ft
 - Size: TBD for definition
 - Piece size recommendations?
 - Door closed immediately
 - Set air settings to medium position
 - One stirring and poking event can occur when there is no visible flame
 - Test ends at after two hours from loading
 - Stove should be able to burn at medium setting for 2 hours. Thoughts on this recommendations?
- Lisa explained that the doors are closed immediately for the medium fire. However, Lisa had to open the doors to stir and poke the fire, as there were no flames. The fire re-lit after this. Lisa explained that the medium fire is currently defined as 2 hours from time of loading, but that Lisa

DRAFT April 7, 2017 --- Do not Cite or Distribute

would like WG feedback on this. She defined the end of the medium fire as 2 hours after loading because it seems reasonable that the unit could be at medium for 2 hours. Lisa noted however that perhaps the end point could be based on 50% of the fuel charge being consumed. Lisa further noted that she is still trying to figure out what the end of test definition should be.

- Next and last, is the **Low Fire Phase**, which is summarized in the below screenshot of Lisa's slide. Lisa noted, that after 2 hours, the coal bed was a little less than 15% [of the 5 lb/cubic foot loading density weight]. For the low fire, the prescribed loading density is essentially to load the firebox with as much wood as it'll take. Lisa allowed room for the tube and noted that she and Mark had used birch for this initial test run.

Low Load Phase

- Open door and load low fire load
 - Loading density: as much as can be loaded without adequate clearance for tubes
 - Size: TBD for definition
- Recommend door closed immediately
 - could remain open for 5 minutes
- Air settings can be modified in the first 10 minutes of the test but must be at low load rate by minute 10:00
- Test end
 - after 90% of fuel consumed
 - Needs definition
 - no weight change after 30 minutes.
- Lisa noted, that after closing the door, she had the air settings at high [open fully] for 5 minutes before closing them down to the low air setting. The end of the test was defined as when 90% of the fuel is consumed (which, Lisa noted, still needs to be defined further) or no weight change after 30 minutes. Lisa further noted that they were still deciding how to define the end of the low fire test and were looking at TEOM data to determine how long to sample to ensure all of the PM was captured. Lisa explained that they may allow one of the low fire runs to proceed all the way to the end (100% fuel consumption) in order to standardize the burn time, but PM measurements wouldn't necessarily have to be taken the entire time. Lisa noted that they were "still at the top of the funnel" in terms of determining the protocol and that this was the first attempt at the "ASTM-in-a-day" protocol. Lisa asked the WG if there were any questions.
- John Barnes (from New York) asked if loading as much wood as possible for the low burn rate was to simulate an overnight burn. Lisa replied yes, that was the purpose, but clarified that she and Mark had not taken filter measurements yet. So far, they have just been trying to see if the protocol is reasonable. To that end, they simply laid out 10 lb/cf worth of fuel charge on the ground and then subtracted out the pieces that did not fit (one piece). Lisa noted that she, as the novice did the loading, in an effort to simulate what the homeowner would do [in the "real world"].

DRAFT April 7, 2017 --- Do not Cite or Distribute

- In response to a question from John Barnes regarding the ratio of [time] at the high burn rate versus the middle burn rate, Lisa explained that she didn't have time to parse the data yet and it was done as one integrated run. John clarified that he wanted to understand why 1 hour was selected for the high burn and 2 hours was chosen for the medium burn. Lisa explained that those duration choices were about the amount of fuel in the stove and how people generally operate stoves. Lisa noted that the stove couldn't burn for 2 hours on 5 lb/cf [for the high burn rate test] without going to nothing [no fuel left]. The idea behind the 2 hours for the medium burn is that this seems a reasonable time that people would burn at a medium setting. That is, a stove could sustain a medium fire for 2 hours and, furthermore, this 2-hour medium burn also provides good conditions to go to the low fire load/test. Lisa noted that they could have ended the medium burn test at 1 hour, but then the fire would need to keep burning before going into the low fire load/test.
- John Barnes wondered if perhaps the manufacturer would/should specify a load based on their design. Lisa replied that they were still in the process of determining the appropriate protocol.
- Lisa noted that one of the things she is grappling with, having the luxury of seeing EPA's [species] data [based on both crib and cordwood], is whether or not cordwood generally burns at a lower burn rate than crib wood at the same air settings, everything else being equal. Lisa further noted that EPA's species testing seems to indicate this, at least based on the pre-NSPS stove that EPA used for its species testing. Lisa would like to know if that would also hold true for a cleaner, NSPS-certified stove.
- Bob Ferguson replied that, based on the testing done [by himself and for ASTM, for example] this is true even with very modern stoves – that is, at the same air settings, cordwood burns at a lower burn rate than crib wood. Bob noted that this general experience/fact is based on using [the relatively high] ASTM loading densities. Bob explained that there's not enough air spacing [in the firebox when loaded with cordwood] and more air would be required in the stove than the cordwood load allows, in order to get to the higher crib-based burn rates.
- Lisa noted that a high fire [open, high air settings] with cordwood could be similar [in burn rate] to a medium fire [medium air settings] on crib. Therefore, as Lisa and Mark do cordwood testing and develop a cordwood protocol on an NSPS-certified stove that was tested for cribs, Lisa wondered if that should be determined/accounted for in some way.
- Bob Ferguson explained that [this differential in burn rates on cordwood versus crib wood] shows up most at the lower burn rates, that is, when stoves are set to the lowest air/burn settings. Bob noted that it probably occurs less on high because, as the fire gets going, there is less fuel weight with cordwood, depending on when the test is ended. If the test doesn't end until 100% of fuel consumption, then the charcoal tail is impactful. Bob noted that the long tail is much more of a problem with cordwood than with crib. On cordwood, the long tails is doubling the length of the test. Bob explained that it takes approximately the same amount of time to burn the last 10% of cordwood as it takes to burn the first 90% of the fuel (on high fire). It's not a linear process, but low fire shows the most difference, according to Bob. Lisa noted that this

DRAFT April 7, 2017 --- Do not Cite or Distribute

was the same phenomenon that occurred during EPA's species testing on the pre-NSPS Vigilant stove.

- Lisa noted that one question that she and Mark had at end of the first trial day of testing was whether the stove's air setting designed for the lowest burn using crib wood should be used when burning cordwood. Or, should she and Mark adjust the air settings to achieve a similar low burn rate on cordwood that was achieved using crib [which would require that the air settings be opened some amount to allow in more air than the lowest setting, as cordwood would require more air to burn at the same burn rate as cribs]. Lisa clarified that it was a ridiculously low burn rate [using cordwood and the lowest crib settings].
- Bob Ferguson replied that, in his experience, fires burning cordwood at less than 1 kg/hr went out and so that air setting may have to be adjusted. Bob noted that ASTM handled that by requiring an 8-hour burn, but of course an 8-hour burn is to be avoided in an integrated run. Bob noted that there are many stoves where the fire will go out when burning cordwood on the lowest air setting designed for crib wood [certification test]. Bob concluded that he didn't have an answer for Lisa, but there is a big difference [in burn rates between crib and cordwood].
- Stef Johnson noted that Lisa would not find a prescriptive one-size fits all [for the cordwood protocol]. Therefore, Stef suggested that it may be better to be descriptive and look for a performance basis for defining the load rather than being prescriptive.
- Lisa noted that this meant playing with the stove [that is, adjusting the lowest air setting]. Moving forward, if a stove is designed to burn cordwood, it wouldn't be designed as stove designed to burn crib. Lisa wondered therefore how to design a protocol for a cordwood stove while using a stove designed for crib wood.
- Stef replied that he understood the conundrum and that an additional challenge is that there will exist many different stove designs. Therefore, the test method probably cannot be hard coded, since there is no one size fits all. Rather than defining the burn rates, Stef suggested considering defining the conditions that the test has to meet – for example, describe the operating criteria.
- Bob Ferguson noted that ASTM had looked into this on a particular stove and determined that the air setting that delivered a 1 kg/hr burn rate while burning a 12 lb/cf cordwood load, would have delivered about twice that burn rate (2 kg/hr) if burning crib wood. Bob noted that this was approximate and was based on one stove. Bob further noted that he agreed with Stef that there will be differences [among stoves]. Bob suggested considering that the protocol require burning X% of fuel or no more than X% of fuel, in order to allow some flexibility to accommodate stove-to-stove variation, but at the same time provide some basic performance description. Bob concluded that this is especially difficult to define after only one day of testing.

DRAFT April 7, 2017 --- Do not Cite or Distribute

- Lisa replied that she and Mark will go back to the drawing board, regarding the cordwood protocol. Lisa suggested that the WG go back to the beginning, the first slide, to see if anyone had any questions on the proposed start-up.
- Lisa noted that Bob Ferguson had noticed that Lisa and Mark were using a lot less kindling in their draft cordwood ASTM-in-a-day protocol than ASTM's method does. Lisa asked if they were using about half of what the ASTM method calls for. Bob Ferguson confirmed that Lisa and Mark used about half of ASTM's start-up load. Bob noted that Lisa's and Mark's stove did look a little thin at start-up and the stove may have been happier with more kindling. Bob further noted that 1 lb/cf of kindling will look thin in some stoves, depending on the size of the hearth. Lisa agreed and noted that the amount used wasn't determined scientifically. Lisa further noted that she would use more starter fuel on the next run/step and may ultimately decide to go to more kindling, perhaps ending up in same the place as ASTM.
- Bob Ferguson noted that Lisa's and Mark's kindling density in their draft protocol was close to what ASTM requires. Bob explained that ASTM's requirement is based on fuel weight. Therefore, a 20% [of fuel load weight] metric for the kindling results in a loading density of 2 lb/cf for kindling and then 3 lb/cf for the start-up fuel. Bob suggested that Lisa start obtaining photo documentation so that people can see what the loads look like. Bob noted that the stove should maintain relatively clean glass and that the load could be seen this way and also with the door open. This way, Bob noted, people can see if the volume passes the reasonable test. Lisa noted that she had photos but wanted to clear those photos with Mark before showing. Bob suggested that Lisa decide where to take photos to avoid having too many photos, but that visual cues are helpful to stimulate discussion among the group.
- Since there were no questions from the WG on the start-up phase, Lisa went on to see if the WG had any questions regarding the high fire phase. Lisa noted that, for the high fire, she and Mark lowered the loading density to 5 lb/cf and wondered if they should go back to 7 lb/cf, in order to be closer to what Method 28R calls for. Lisa noted that she was agnostic about this decision. Lisa also asked the WG if they should be using small or large pieces in the high fire phase, or perhaps a mix of both.
- John Barnes asked in response what the homeowner/consumer would most likely do.
- Lisa explained that she and Mark used pieces that were twice the size of the starter fuel, but not the biggest pieces, with the rationale that the coal bed is not yet established when going to a high fire right after start up. Therefore, a homeowner wouldn't use the big pieces yet and Lisa decided to use small and medium size pieces, with not specific size definition. Lisa noted that her recommendation would be for the pieces to be on the smaller size for the high fire phase.
- Regarding the medium fire, Lisa again displayed the medium fire slide for the WG, and noted that she recommended larger pieces for this phase, because there is a better-established coal bed at this point. Therefore, the homeowner/consumer is more likely to use bigger pieces.

DRAFT April 7, 2017 --- Do not Cite or Distribute

- Rod Tinnemore asked for confirmation that Lisa doesn't yet have a way of defining piece size. Lisa confirmed that she did not yet, but would have to determine a definition.
- Lisa noted that, for the low fire phase, she and Mark used a mix of piece size to get as many pieces into the firebox as would fit.
- Rod noted that the smaller loading density [used in Lisa's and Mark's draft protocol] does provide more flexibility for the smaller firebox sizes, since there are smaller stoves out there on the market. So, as stated, the protocol is not running the risk of the load not being able to fit into the firebox, whereas that's not a risk going upwards in firebox size. Lisa noted that was a good point and further noted that they were using a medium firebox for testing currently, but would need to go to smaller and larger fireboxes.
- Randy Orr noted that it's reasonable for the protocol to call for small pieces for the High Fire load, medium to large pieces for the Medium Fire load and a jigsaw size mixture of small, medium and large pieces for the Low Fire load.
- Lisa noted that she would post the "ASTM-in-a-day" (i.e., multiple burn rates and load weights in one consolidated/integrated run) protocol to Basecamp and asked WG members for feedback regarding variables or directions that Lisa and Mark may not have yet considered.
- Rod Tinnemore commented, regarding the 2-hour medium burn, that it's difficult/problematic to have an external factor [static requirement] applied to all stoves. Rod noted that other factors need to be examined to determine something other than a rigid timeframe. Lisa agreed and noted that she and Mark had discussed whether setting a rigid timeframe was providing loopholes for some stoves and hurdles for other stoves. Rod noted that he'd like not to build in [a need for] exceptions, but rather make the protocol as flexible as possible to work for a wide range of stoves.
- Lisa noted that, as an alternative [to a rigid time requirement], she is considering instead that the protocol call for burning down the coal bed to a percentage of the fuel load. Stef Johnson noted that he thinks that's a good metric. Lisa clarified that she's thinking about the protocol calling for burning down the coal bed by 50% from the High Fire to the Medium Fire and then by 25% from the Medium Fire to the Low Fire. However, Lisa noted that she's trying to balance those percentages so that the test doesn't go too long.
- There were no further comments or questions. Lisa noted that she and John Crouch would get back to the WG after reviewing their schedules. Lisa will post this presentation to Basecamp along with photos (with Mark's permission). Lisa will also post PDFs of EPA's species testing to Basecamp.
- Meeting adjourned

Message

From: Jill Mozier [mozier.jill@ecrweb.com]
Sent: 3/6/2017 10:04:27 PM
To: Lisa Rector [lrector@nescaum.org]; John Crouch [crouch@hpba.org]
CC: Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRIO2]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Graham Fitzsimons [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=user1ff2e955]
Subject: Draft Meeting Notes from the February 23rd Operation & Fueling Workgroup Call
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 2-23-2017.docx

Lisa and John,

Attached are the notes from the February 23rd meeting of the Operation & Fueling Workgroup.

I'll be on the call this Thursday March 9th at noon.

Thanks,
Jill

Jill Mozier
mozier.jill@ecrweb.com
(919) 433-8334
EC/R Inc.
Chapel Hill, North Carolina
A Wholly Owned Subsidiary of
SC&A, Inc.

DRAFT March 6, 2017 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from February 23, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), Allen Carroll (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- The workgroup (WG) discussed two approaches for allowing a stove's design to dictate the low and high burn rates, rather than M28's specified burn rate categories: (1) ASTM's hybrid approach of allowing a stove's design to dictate the low and high burn rates, but also including a specified low burn rate duration with a low burn rate cap; versus (2) John Voorhee's approach of not requiring any specified low burn rate duration or cap, but merely requiring clear labeling regarding a stove's low burn duration, efficiency, emissions, etc.
- The WG discussed their intent that the labeling would be required within the cordwood test method (CTM) itself, which they expected/hoped would be promulgated by EPA as a federal reference method (FRM) to be incorporated by the wood heater NSPS.
- It was clarified that ASTM's terminology "primary air controls" refers to any and all controls that cause a stove to burn at its lowest and highest. For clarity, it was suggested that the modifier "primary" be dropped so that the CTM refer merely to "air controls" to avoid any possibility that a stove could be turned lower (or higher) than the CTM requires.
- The WG members expressed concern about making a firm decision regarding whether or not a low burn rate duration and/or low burn rate cap need to be specified by the CTM when the other aspects of the CTM test cycle were not yet decided (e.g., end of test definition, if the test will be cut-off prior to 100% of fuel consumption, if the test will be hot-to-hot or cold-to-hot).
- Although the WG was not ready to make a firm decision regarding using or dropping low burn duration and low burn rate cap requirements in the CTM (e.g., as required in ASTM's CTM), the

DRAFT March 6, 2017 --- Do not Cite or Distribute

WG was comfortable leaving the issue on the table for further consideration. The WG unanimously decided that requiring (or not) a specific low burn rate duration or cap in the CTM – as a concept – could be entertained further. That is, John Voorhee’s proposed approach of allowing the stove’s specific design to dictate the low and high burn rates – without requiring a low burn duration or low burn rate cap – need not be rejected at this point.

To-Do List:

- Lisa Rector and John Crouch will discuss next steps for the March 9th call and Lisa will send out an agenda for this call.

Highlights from Meeting:

- Lisa Rector opened the workgroup (WG) meeting, noting that the agenda for today’s call included recapping the last call’s conclusions (from February 9th) and discussing refinements to the voted-upon burn rate approach.
- The following WG participants were present on the call: John Crouch, Lisa Rector, Gregg Achman, John Barnes, John Voorhees, Stef Johnson, Lisa Herschberger, Randy Orr, Rick Curkeet, Bob Ferguson, Bob Lebens, John Wakefield, Amanda Aldridge, Cindy Heil, Phil Swartzendruber, Jill Mozier plus others who joined later or did not identify themselves.
- Lisa recapped that the WG had made its first decision regarding burn rates. A vote was taken during the February 9th call and all present concurred that the recommendation for a future cordwood test method (CTM) is to define what low, medium and high categories are by stove design, rather than by specified burn rates and rather than stoves being tested at a percentage of their max burn rate. Lisa noted that, from that discussion, the WG looked at John Voorhees’ proposal (that the CTM burn rates be based strictly on the individual stove design) versus ASTM’s hybrid approach (which is based on design but also includes minimum burn rate parameters such as kg/hr caps on the min burn and a burn duration requirement). Lisa thanked John and Bob for pulling together the draft of these approaches that Lisa had e-mailed out to the WG and posted to Basecamp.
- Lisa noted that the WG needs to further flesh-out what burn rate by design means. Lisa also noted that she has some questions about whether only the primary air settings are set to low and high, or all air settings are set that way. Lisa asked John Voorhees and Bob Ferguson to give a brief overview on the two approaches.
- John Voorhees noted that his proposal is spelled out clearly in the document [that Lisa e-mailed out to the WG and posted to Basecamp, *Burn Rate Options 2 23 2017 call.docx*]. John explained that the low burn rate [“low fire”] would be determined by an appliance tested at the lowest setting the appliance can be set at, while the high fire is the opposite with the appliance set at the maximum air setting that the appliance can be set at. Regarding Lisa’s question of whether only the primary air controls or all air controls were set, John explained that basically any air setting that would allow the appliance to burn at the highest or lowest burn rate should be set accordingly. Then medium burn rate would be determined by bracketing between the high and low burn rates – whether at the midway/50% point between high and low or at lower than that

DRAFT March 6, 2017 --- Do not Cite or Distribute

can be determined later. John noted that the only difference between what he's proposing and what's in ASTM's draft CTM is that there wouldn't be a minimum burn requirement [kg/hr cap] or burn duration requirement. In addition, John noted that there would also be a labeling requirement at the point-of-sale regarding appliance performance information such as emissions, max burn time during testing, etc. The exact contents of the labeling requirement is up for discussion, but John noted there is agreement that informing the end consumer is pivotal.

- Lisa Herschberger asked about implementation, regarding how consumer would know what they're getting. Lisa noted that she's curious what EPA would say, given that the current NSPS is in place. Lisa wondered how these labeling ideas could be implemented given the current regulation. John Voorhees replied that any standard usually has a part for markings and labeling - whether CSA, UL standards, etc. The labeling requirement could be clearly stated in the standard and then the manufacturer would be required to meet it. Lisa Herschberger wondered however, how such a labeling requirement in a CTM would be implemented within the context of the existing NSPS. John noted that the goal of this effort by the WG was developing a federal reference method [FRM] which will be presented to EPA.
- Lisa Rector clarified that John Voorhees was saying the labeling requirement would become part of the test method. Lisa explained that EPA will have to do a rulemaking to incorporate this new CTM into the NSPS, but EPA was not reopening the NSPS itself. Rather, this new test method was being pulled into the NSPS. [No comment was offered by the EPA either in agreement or disagreement.] Lisa Rector noted that she will also advocate that a new column showing each stove's burn time be added to EPA's certified stove list.
- Bob Ferguson noted that whatever tool is used, whether the ASTM method or another method, this will be a case where all sides are in agreement that the information provided to the consumer must be in a simple-to-understand format on hang tags and other places. Bob pointed out that, wherever it's decided that this information is needed [in terms of labeling], there will be universal support for it. John Voorhees agreed that everyone is in agreement that more education for the consumer is better and also mentioned that perhaps such information could be provided on the carton that the appliance is boxed in.
- John Crouch opined that it's worthwhile to remember that in the past consumers have unintentionally been given misinformation. John pointed out that the information provided to consumers [in the past and currently] is based on the high burn rate using crib wood and, in addition, the consumer is not told how much crib wood was burned or how long it burned. Therefore, John noted, the information provided often gave consumers an erroneous understanding. John agrees that the more information that can be given to the consumer based on cordwood, the better, and the more accurate the sizing of the stove will be.
- Lisa Herschberger asked if there was any way to address the issues and concerns that Bob Lebens had raised [on the February 9th call] regarding stoves being modified to burn outside this range.

DRAFT March 6, 2017 --- Do not Cite or Distribute

- John Voorhees noted that modifying/ tampering with appliances is possible now, but it's clearly stated in the manual and in the NSPS that any modifications to the appliances are against the law. John noted that yes, people break the law. But if people modify the appliance it would nullify the warranty and the safety listing of the appliance. So, if there were a fire or other mishap, such modification would also probably nullify the insurance. John Voorhees clarified that on stoves his company manufactures, they clearly state that any modification nullifies the warranty. John noted that the wording [his company uses], which may be right out of the NSPS standard, is very strong and notes that any modifications can cause fire and even death. John concluded, in response to Lisa Herschberger's question, that there is no way to prevent [people illegally modifying their stove], but it's clear that if they choose to modify the stove, there are serious consequences.
- Gregg Achman opined that there may be less inclination to modify stoves [with this proposed labeling] perhaps, since the consumer will know [better] how it will perform.
- Lisa Herschberger wondered if all this information [being proposed for the label] would be provided to the consumer in big print, so people really see and understand it, or buried [somewhere in the product literature] so people don't really see it. In general, Lisa wanted to know how clear the information will be to the consumers so they understand the implications of modifying their stoves. John Voorhees noted that he didn't recall exactly (without the literature in front of him) where it's stated currently, but it is stated in a couple places in his company's manuals.
- Lisa Herschberger asked if there was a way to include it [any proposed clear labeling] in with the testing revision [that is, the new CTM to-be-proposed]. John Voorhees responded sure, that it's not uncommon to require that a standard must be a certain size font. Gregg Achman noted that such labeling would follow ANSI Z535 and its requirements for wording, color and other labeling instructions for safety warnings. [Note: See for example http://www.appliedsafety.com/wp-content/uploads/2011/08/ansi_z535dot6_article.pdf.]
- Bob Ferguson noted that he fully agreed [that the labeling information and warnings not to modify] should be in an obvious place to be seen by consumers and installers. Bob further noted however that the safety standards organizations do not want everything to be a caution or a warning, as different things merit more importance and if everything is emphasized as a danger, then nothing ends up being emphasized/perceived as a danger. However, Bob noted that something like this [modifying the stove], since it is a violation of federal law and since the warranty and safety listing are voided, will probably rise to a high level in terms of the safety listing [and how it's displayed]. Bob opined that EPA can deal with this when adopting the new standard, regarding what must be done to be in compliance. Bob explained that not all test methods have labeling requirements. Safety tests generally do have labeling requirements, but performance standards often do not, as performance standards generally feed into other laws/standards which put forth the labeling requirements. Nonetheless, Bob noted, this can be dealt with by just determining what the appropriate vehicle is to address anti-tampering.

DRAFT March 6, 2017 --- Do not Cite or Distribute

- Lisa Rector asked Bob Ferguson to give a brief summary of the ASTM process.
- Bob Ferguson noted that the ASTM balloting for the draft CTM closed recently with no substantive negatives. There was one negative ballot from a “very ASTM-oriented person” who suggested some editorial tweaks. Therefore, the draft CTM is in process of its very final version, including edits by balloters. Next the CTM is sent to the editors and ASTM standards board. Bob noted that he expects to see the published CTM standard within 2 months. Bob explained that the interesting thing about ASTM is that if everyone is on board with for example, the burn rate changes being discussed by the O/F WG, then ASTM’s CTM standard can be reopened, so that the burn rates may be redefined. Bob noted that this can be done at any time, that one need not wait for x years to reopen it. The ASTM process is an open process. So, if the WG can come to agreement and if the agreed changes pass muster with the ASTM balloting process, then these changes can be incorporated into a revised ASTM CTM at any time.
- Bob explained that the ASTM burn rates [in the ASTM draft CTM] were an attempt to bridge the gap of M28 cribs and ASTM 2780. ASTM 2780 was done years ago and there was still lots of discussion about maintaining some control over the burn rates. So high, low, and medium burn rates are defined. ASTM reconsidered the critical low fire and considered burn duration as the critical criterion, rather than burn rate. Therefore, the stove must meet an 8-hour burn duration [at a burn rate not to exceed 1.5 kg/hr]. If the stove cannot meet that burn duration because it’s too small to hold enough fuel, ASTM implemented a fixed low burn rate requirement of ≤ 1.15 kg/hr. Bob explained that, based on ASTM task group discussions, there was a concern that a large stove could have a minimum burn rate, meet the 8-hour burn duration with no problem, but meet it with a relatively high burn rate. Therefore, ASTM added another requirement – that is, that the minimum burn rate can be no higher than 1.5 kg/hr, regardless of burn duration (even if 8 hours or more).
- Bob noted that ASTM’s formulation bridges the gap from burn rates in place since the 1980’s on cribs. ASTM kept some of the elements (e.g., finite numbers are included in the low burn rate definition) yet ASTM’s method allows more flexibility in that the primary criterion is defined as an 8-hour burn. Bob noted however that lots of discussion has been happening in the last year that wasn’t happening previously. Nonetheless, that’s how ASTM arrived at its draft CTM as a method “somewhere in between”, with more flexibility for stove design but with some burn rate criteria still bracketed. ASTM’s high fire is the maximum burn rate. Bob clarified that if the air is affecting burn rate, then those controls should be at the highest [for the high fire] or the lowest [for the low fire]. Bob explained that many stoves are down to 1 or 2 controls and some is secondary air that may not impact the burn rate. Regardless, Bob clarified, the controls should be set to be truly maximum or truly minimum.
- For the medium burn rate, Bob explained that ASTM wanted the definition to set the medium burn rate in the lower half between the high and low burn rates, in recognition of the fact that consumers burn there. ASTM also wanted to ensure that the definition of the medium burn rate wasn’t merely an artifact of the test method (e.g., burning last 10% of high fire fuel happened to land the burn rate in the medium category). Therefore, ASTM’s draft CTM requires a physical air

DRAFT March 6, 2017 --- Do not Cite or Distribute

setting to be changed. Literally, the consumer will set air at the medium setting: at about halfway on the air control whether it be a knob, lever or slide. Bob reiterated that the tester needs to physically make a change on the appliance for the medium fire test.

- Lisa Rector note that the O/F WG decision regarding defining burn rates based on stove design was decided on the last call. However, there are 2 subsets within that definition: (a) let manufacturers design what they want and merely require labeling that includes the maximum burn time (this is a drastic change from M28); or (b) ASTM's draft CTM approach which, as Bob Ferguson explained, is a middle ground that requires a burn time and includes a low burn rate cap. Lisa asked Bob Ferguson to explain why the ASTM method uses the nomenclature "primary air controls", noting she was a little concerned about that [given there could be more air controls than primary air controls].
- Bob Ferguson explained that "primary air" is defined [in the ASTM method] as air that impacts the burn rate. Therefore, if it impacts the burn rate, it's primary air, even if the stove manufacturer calls it secondary air in the stove design. Bob explained that air that enters from tubes at the top is generally secondary air that's needed to complete combustion of volatiles. Catalytic stoves provide additional air in front of the catalyst, but usually that is separated from the combustion that's going on in the firebox. Other [non-catalytic] designs also have secondary air that's separated from the combustion firebox. Bob noted that it's complicated, but for the most part, there is a control on every stove that is the determinant on how fast the fire will burn. Other controls may control secondary air and some are automatic controls. But usually there is one control that is the primary determinant of how fast or slow the stove's fire will burn. Bob noted that any method should not give people the opportunity to game that. Bob opined that he thinks ASTM's language works [as written], but ASTM can look at it again to see if the definition of primary air is clear enough. The intent was that primary air is any air that controls the burn rate.
- Lisa Herschberger noted that it's important not to allow people to move around that requirement [in the method regarding setting all air controls to lowest]. Randy Orr agreed and noted that if the secondary air control changes the burn rate, then the method needs to control for that.
- Lisa Rector asked the WG if setting the minimum burn time/duration is important or if John Voorhees' concept is acceptable, which allows the manufacturer to decide.
- Randy Orr replied that the manufacturer should be allowed to decide and if their stove only achieves a 6-hour burn time, then they will face low sales. Lisa asked the WG then if it was more in line with John Voorhees' approach.
- Bob Ferguson replied yes and noted that Voorhees' approach really only changes a few words in an ASTM section, while the rest of ASTM's draft CTM wording works well. Bob explained that the one section that defines the 8-hour duration and low burn rate cap would come out of the

DRAFT March 6, 2017 --- Do not Cite or Distribute

ASTM method and John Voorhees' language would replace it. Bob concluded therefore that it'd be pretty easy to get to the end line.

- Regarding the ASTM section on air controls, Lisa Rector noted that if the WG decides to move ahead without a required burn time/duration, then perhaps ASTM can remove the word "primary" as an adjective of "air controls". Lisa suggested calling it merely "combustion air controls" instead of "primary air controls."
- Bob Ferguson noted that for high fire there's no issue, as some secondary air is needed. For low fire, the secondary air controller would also be in the appropriate place. Therefore, Bob noted that he doesn't have a problem changing this wording if it makes people uncomfortable. ASTM can come up with a definition that everyone is comfortable with. All air controls should be in position that results in lowest burn rate for low fire. Bob noted that, if secondary air controls are affecting the burn rate, then he's all for including that in the method's instructions. All air settings should be placed to ensure the lowest burn rate – that was ASTM's intent, but maybe it's not clear enough. Bob noted that he is open to making improvements to make what the method requires meet the intent. Bob opined that all are on same page regarding the intent.
- Lisa Rector asked WG members to weigh in regarding whether or not there should be a minimum burn duration and low burn rate cap.
- Bob Lebens noted that the WG hasn't decided yet on what the test cycle will look like and that may have a bearing [on what's decided regarding the burn duration and low burn rate cap]. For example, Bob noted that if the test cycle is cut off at 90% [of fuel consumed rather than 100%], then that will have a bearing on the question. Or, if the cycle is hot-to-hot versus cold-to-hot, that too would have a bearing on this. Lisa Rector agreed with Bob Lebens' point, as they pertain to a composite run. Bob Lebens clarified that he was speaking about the question of minimum burn times/durations.
- Lisa Rector explained that she was asking a high-level question – that is, does the test method need to set a requirement regarding burn duration – for example but not necessarily, an 8-hour burn duration. The high-level question regards whether or not the burn duration requirement need to be there, not what the specific number of hours needs to be, at this point.
- Bob Ferguson noted that Bob Lebens raises a good point. When ASTM looked at this, the cold-to-hot fire was stopped at 90% because the long tails were skewing the heat output rate as well as the g/hr emission rate. But, Bob noted, Bob Lebens is right. At the low fire, ASTM's intent is to burn 100% of the fuel load, but at a minimum 90% of the load must be burned. If the fire goes out or if the test is cut off early, the 8-hour duration may not be met. Bob Ferguson explained that it's on the manufacturer to meet the 8-hour burn duration. Not meeting [the 8-hour burn duration] errs on the side of higher emission values in terms of g/hr or in not meeting the duration requirement – therefore, all the risk is on the manufacturer, Bob pointed out.
- Randy Orr noted that the endpoint of the test needs to be defined and put on the tag/labeling.

DRAFT March 6, 2017 --- Do not Cite or Distribute

- Bob Ferguson explained that ASTM's end-of-test definition was based on test results. The low fire going to 100% made the most sense for the low fire. But for the high fire, the data indicated that stopping at 90% was okay. Bob noted that if the WG essentially decides to let the market decide, then all of this is off-the-table [and doesn't need to be defined]. But if finite numbers are used to define a burn rate cap of minimum burn duration, then the WG needs to think about the test cycle in order to avoid an overdetermined system [too many constraints].
- Lisa Rector wondered what should be asked, or if perhaps it cannot be answered now. Lisa noted that the WG has a general idea of where it wants to move with burn rate. Lisa therefore wondered if the WG should move onto operational questions, or if the finite burn times question needed to be answered first.
- Bob Lebens opined that ultimately it depends on what the test cycle looks like and the WG hasn't yet discussed the test cycle. Bob noted that perhaps the emission testing cycle of these appliances isn't directly related to how they are operated in the home. If so, Bob wondered how to match these up.
- Bob Ferguson noted that the testing cycle is also tied to the fuel loading density. ASTM currently calls for a 12 lb/cubic ft loading density for the low and medium fires. The burn duration requirement and the fuel loading density are tied together. It's unclear what burn duration can be required under a lower loading density. Bob pointed out that there are lots of moving parts tied together.
- Lisa Herschberger wondered if it would make sense for people to put forth proposals that include fuel load, a cut-off for the low burn/fire test, whether there needs to be low burn rate cap or minimum low burn duration, etc. Perhaps these elements could be put in a proposal and then the WG could find something that fits for all people.
- Regarding ASTM's approach, Bob Ferguson noted that the hot-to-hot test cycle and fuel loading density were part of the discussion when the 8-hour minimum burn was set. Bob noted that these are all tied up in a knot together. If fuel loading density or something else is changed, then the process would need to go back around the loop to see what's able to be achieved, so that it's not an overdetermined system. Bob noted that one needs to ensure all components work together.
- John Voorhees explained that he's proposing using everything in the ASTM standard, except taking out a sentence or two in order to remove the 8-hour minimum burn time (with the 1.5 kg/hr cap) and to remove the alternative 1.15 kg/hr minimum burn rate cap.
- Gregg Achman noted that it's a paradigm shift to even consider whether these things are needed or not. Lots of things are intertwined, but fundamentally the question is whether or not a fixed low burn rate is needed to move forward. This is a fundamental question "at the top of

DRAFT March 6, 2017 --- Do not Cite or Distribute

funnel” and, in order to keep going down the funnel [progressing in developing a CTM], the fundamental question of whether or not a minimum burn rate is needed needs to be decided.

- Lisa Herschberger agreed that whether or not to have a low burn rate cap or minimum burn duration is a threshold question.
- Bob Ferguson noted that the burn duration requirement is less restrictive than the low burn rate [cap] requirement; a fixed low burn rate for all stoves regardless of size is most restrictive. ASTM’s CTM is something in the middle that includes a [finite] number of hours for the burn duration [plus a finite low burn rate cap] versus the least restrictive which is no burn rate or burn duration requirement (that is, John Voorhee’s proposal of leaving burn rates up to the design).
- Lisa Rector noted that she wanted to check-in to see where WG members are regarding their thoughts on minimum burn rate and minimum burn time/duration. Lisa asked if WG members need more time or more information.
- Randy Orr noted that, for a test method that burns 100% of the fuel, coals should still remain [because consumers need coals in the morning]. Bob Ferguson clarified that the ASTM method ends back where it started, with the starting fuel. Therefore, the coals are still there.
- Lisa Rector noted that she wanted to go back to a higher level, to the fundamental question at the top of the funnel – that is, are minimum burn times and specified burn rates needed in the test method or is that a design function?
- Randy Orr noted that he did not care how long the stoves burn [for the test method], but he just wants the end of the burn to look a certain way.
- Lisa Rector noted that she’s been thinking of integrated and composite runs that move far away from the ASTM and M28 methods. Those are examples of thinking out-of-the-box that the WG hasn’t even gotten to. But, Lisa noted that for this step, she is trying to put some frame around how far folks are willing to go. Lisa further noted that, if the WG is not willing to give up much of the [current] test method – for example, hot-to-hot or steady state – that’s important to know. Or do folks want to think about something very different [than the current test method]?
- Randy Orr opined that consumers will want to know how long a stove will burn. Consumers want to know, for example, whether there will be coals in the morning after going all night [without loading or tending].
- John Voorhees clarified that what is being asked is whether the WG is comfortable with the concept [not the actuality]. That is, rather than having to decide now that the minimum burn rate requirements should be thrown out, the WG is being asked merely to entertain the concept. The question is: does anyone have problem with the idea of throwing out the minimum burn time/duration [and low burn rate cap]? John pointed out that questions such as how the

DRAFT March 6, 2017 --- Do not Cite or Distribute

test ends, what exactly the burn duration should be, etc are further down the funnel. So, John asked, is everyone okay with the concept of not having [these finite requirements], rather than having them?

- Lisa Rector agreed that this was the question on the table – that she liked John’s explanation of this being about whether or not the WG is open to the concept. John Voorhees noted that he had never heard of the concept of not having a [finite] low burn rate and would like the WG to consider what it is needed for. John further noted that [the current method] is forcing some appliances to burn below where they should. John opined that rather, let the market decide.
- Lisa Herschberger noted that that was what she was saying as well, regarding what the [specific] set of conditions would be. Lisa replied that she is okay having an open mind, but would want to see the set of conditions to capture all emissions, inform consumers and [at the same time] not constrain the design.
- Tom Morrissey [who noted he was on the call but could not join the webcast because it says the webcast is oversubscribed] opined that there is going to be a low burn rate test, that’s clear. The only question, according to Tom, is how [that low burn rate] is defined – whether the lowest setting, 1 kg/hr, 1.5 kg/hr, or something else. Tom further opined that there will be something in this method so that, when an appliance is turned down low, the method provides the resulting [emissions] profile – there is no question there. Tom noted that when he reads or hears “let’s let the market decide/determine it” his BS detectors go off, because the market doesn’t determine this. Tom explained that manufacturers have been disingenuous when they inform consumers what their appliances do. Therefore, the test must show real world emissions on high and low – unquestionably, in Tom’s opinion.
- Lisa Rector agreed and noted that’s conceptually where the WG is at – that the stove must be tested at the highest and the lowest.
- Tom Morrissey noted that all manufacturers promise overnight burns [of at least 8 hours], even on small stoves. Now there are manufacturers promising everything up to 40 hours.
- John Voorhees replied that that’s a marketing thing that the WG will eliminate by the test itself defining it. John noted that he is proposing that the test method safeguard against such false claims.
- Tom Morrissey pointed out however that there is no prohibition against marketing material claiming that the test results don’t mean anything and instead claiming that the manufacturer’s own lab results are more relevant. John Voorhees pointed out that the WG is moving toward a cordwood method. Tom replied that that does not prohibit bogus claims and there will be bogus claims.
- John Barnes noted that EPA will be certifying and assumed EPA would monitor marketing claims.

DRAFT March 6, 2017 --- Do not Cite or Distribute

- Tom Morrissey replied that no, EPA never has [monitored marketing claims] and never will because EPA doesn't have the staffing to handle such monitoring.
- Amanda Aldridge noted that she [as the EPA oversight person] did monitor marketing claims in the voluntary [hydronic heater] program. But, the work load is admittedly overwhelming now and she hasn't had the time [recently, with respect to the NSPS].
- Tom Morrissey noted that, if one wants to see complete and utter BS, then look at the stoves for sale at Home Depot and read the tags. Then, look up the EPA testing [on these same stoves]. The claims are all over the place, according to Tom.
- John Crouch noted that that's why stakeholders are moving to a cordwood test, with high and low burn times tested and then reported to the consumer. John opined that the current results [based on M28] give consumers a distorted view, because M28 is not representative of how the stove would be operated in the real world and because consumers don't understand [this disconnect and what it means].
- Tom Morrissey noted that the method should try to move beyond human nature.
- John Crouch replied that the method standardizes that; [the proposed method being discussed by the WG] takes such claims out of marketing and puts them in the engineering world [where they belong]. The proposed method will define efficiency, burn time etc. John noted that the first NSPS didn't anticipate all this and used a whacky fuel load.
- Tom Morrissey replied that he found John's statements unpersuasive. Tom opined that EPA wants to know and the consumer wants to know what happens [what's emitted and for how long] when the stove is turned down to its lowest setting.
- John Crouch replied that that's what the WG and John Voorhees is proposing. John Voorhees agreed that is what he's suggesting.
- Tom Morrissey opined however that "letting the market decide" is a nonstarter and should be thrown in the trash.
- Lisa Rector noted to Tom Morrissey that, if the WG decides to go down this route, there will have to be clear labeling requirements in the test method, which not all test methods have. Lisa noted that folks basically agree that consumers need to know how long a stove will burn [especially on low] and how much pollution it produces.
- Tom Morrissey noted that, in addition, the data needs to be comparable.
- Regarding this issue that Tom raised, Lisa Rector noted that one of the tradeoffs [in going from M28 to a new CTM approach] may be standardization and comparability, as what is low in one stove is not low in another.

DRAFT March 6, 2017 --- Do not Cite or Distribute

- John Crouch agreed that the consumer needs to know how much heat is put off on low, how long it burns on low and what the stove's emissions are. The same things need to be conveyed for the high burn rate. John noted that there is not any disagreement on that. John pointed out that he [and John Voorhees] are not advocating for the current system [under M28], but rather for how the system should work.
- Lisa Rector clarified that the minimum burn rate is not the low burn rate [that is being discussed]. The current minimum is 1 kg/hr, while the low burn rate being discussed for testing under a proposed CTM is the burn rate when the stove is set at its lowest burn setting. Lisa noted that the question is: should a stove be required to burn at 1 kg/hr?
- Rick Curkeet noted that he is a big proponent of test methods being performance measurements and not being prescriptive. The test method should measure performance parameters like heat output, emissions, burn time, etc. The test method should determine all this and report on it. There should be standardization, but the method shouldn't be prescriptive. Regulators determine what is the maximum allowable emissions and the minimum allowable efficiency, Rick noted. But, as long as everyone uses a standard method, then the marketplace will indeed determine what is adequate, Rick opined.
- Lisa Rector noted that the call had gone over the scheduled one-hour time slot, but that she was at a loss regarding how to proceed. Lisa noted that she's sensing that folks are comfortable with exploring this. Lisa asked if there are any WG members for whom the concept is totally distasteful, even to explore. Lisa further noted that, even if no one has an issue with it conceptually, there are concerns voiced about what happens in practice. So, Lisa pointed out, that the WG is not ready to make a firm decision yet.
- Phil Swartzendruber agreed that how Lisa described the decision-to-be-made/situation makes sense and the WG should retain on the table the question – that is, is it reasonable to maintain a kg/hr burn rate requirement?
- Lisa Rector asked if there was any opposition to keeping it on the table. No one voiced opposition. Therefore, Lisa noted that the question is still on the table, still in play. The WG will move forward with that. John Crouch and Lisa will discuss about where to go next.
- Lisa noted that she would send out an agenda for the March 9th call. Lisa further noted that she will try to address the webcast access issues and apologized that some people couldn't join the webcast today. Lisa concluded that she looks forward to seeing those in Atlanta who will be there and she will join the rest of the WG participants on the next call, March 9th.
- Thank you to all. Meeting adjourned.

Message


From: Jill Mozier [mozier.jill@ecrweb.com]
Sent: 2/22/2017 8:37:43 PM
To: Lisa Rector [lrector@nescaum.org]; John Crouch [crouch@hpba.org]
CC: Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Graham Fitzsimons [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=user1ff2e955]
Subject: Operation & Fueling Workgroup Meeting Notes from February 9th
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 2-9-2017.docx

Lisa and John,

Attached are the draft meeting notes from February 9th. Thank you again for recording it for me.

I'll be on the call tomorrow at noon.

Jill

Jill Mozier
mozier.jill@ecrweb.com
(919) 433-8334
EC/R Inc.
Chapel Hill, North Carolina
A Wholly Owned Subsidiary of


DRAFT February 22, 2016 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from February 9, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), Allen Carroll (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- The workgroup (WG) discussed ASTM's hybrid approach to defining low, high and medium burn rates along with capped minimum burn rate(s) and burn duration requirement; the idea of basing burn rates on how the individual stove being tested was designed; the continued need (or not) for a specified minimum burn rate (as in EPA's Method 28); the importance of heat output to the consumer and the consumers' tendency to burn at low settings; the problem of a stove's low air setting being designed to meet M28's low burn requirement on crib and then burning cordwood in the field (in-homes); the value of moving toward a test method that better reflects in-home use; and the value of labeling the tested burn rates and achievable burn duration of each stove for the consumer (while allowing stoves to be tested based on their individual design).
- The WG voting members present on the call voted on which of the following 3 concepts to move forward with as a basis for burn rates in a cordwood test method. Seven (7) of the voting members present voted for #1 below, while 1 member voted for #2, with 4 votes TBD:
 1. Let the manufacturers design the stove and test according to that design (i.e., the low burn rate is whatever the lowest setting and burn rate is for that specific stove, the highest burn rate is at the max air setting for that stove and the medium is in between), aka "definitional burn rates";
 2. Specify burn rates with fixed numbers regardless of the individual stove being tested (i.e., define burn rates as M28 does); or
 3. Specify burn rates as a percentage of the maximum burn rate for that stove.

DRAFT February 22, 2016 --- Do not Cite or Distribute

- The O/F WG voting members voted as follows:
 - Gregg Achman – #1
 - John Crouch – #1
 - John Voorhees – #1
 - Rod Tinnemore – #1
 - Cindy Heil – #1
 - Randy Orr – #1, but with the caveat that the burn rates and burn times must be expressly indicated on the label
 - Bob Lebens – #2
 - Lisa Rector – #1, with labeling requirement
 - Ben Myren – not present, Lisa will contact and obtain his vote;
 - Tom Morrissey – not present, Lisa will contact and obtain his vote;
 - Tom Butcher – not present, Lisa will reach out to and obtain his vote;
 - Lisa Herschberger – not present, Lisa will contact and obtain her vote.
- The WG agreed to discuss refinements to the definitional burn rate approach on February 23rd using the draft ASTM cordwood method as a starting point – for example, should ASTM’s 8-hour burn duration be required with capped minimum burn rates or should these requirements be dropped in favor of strict labeling requirements.

To-Do List:

- Lisa Rector, John Crouch and Bob Ferguson may put a chronological summary together regarding ASTM’s process in developing the approach taken in the ASTM draft cordwood method.
- Lisa Rector will obtain the votes of the 4 WG voting members not present.
- John Voorhees will prepare a short summary (~3 sentences) of the refinement being contemplated (ASTM’s refinement versus John Voorhees’ market-driven labeling idea) and e-mail it to Lisa Rector and John Crouch for editing. Lisa Rector will post the refinement summary to Basecamp so WG members could review it prior to the next meeting on February 23rd.
- Bob Ferguson will send Lisa Rector the current ASTM draft cordwood method and Lisa will post it to Basecamp for everyone.

Highlights from Meeting:

- Lisa Rector opened the workgroup (WG) meeting, noting that the meeting was being recorded since meeting note-taker, Jill Mozier, could not be present on the call.
- Lisa noted that the following people were in attendance: John Crouch, George Allen, Gregg Achman, Amanda Aldridge, Bob Lebens, Cindy Heil, Mark Champion, Gaetan Piedalue, John Voorhees, Kelli O’Brien, Randy Orr, Bob Ferguson, Rod Tinnemore, Mike Toney, John Wakefield and others who may have joined the meeting after roll-call.

DRAFT February 22, 2016 --- Do not Cite or Distribute

- Lisa noted that on last week's call the WG left it that burn rates would be discussed today and that a vote would be taken regarding where the group is going with burn rates. Lisa further noted that since some voting members are missing today, the floor would be opened up for discussion on different ways to define burn rates within the test method and the pros and cons of each of these ways would be discussed. When the end of that discussion is reached, Lisa noted that she would like to take a vote to see where the group is on this issue. Lisa noted that 4 voting members were not present on the call but, according to the rules agreed upon for the WG, these voting members could vote subsequent to the meeting.
- Lisa reminded the WG that the following people are voting members: Cindy Heil, Tom Butcher (not present), John Crouch, Gregg Achman, Lisa Herschberger (not present), Ben Myron (not present), Randy Orr, John Voorhees, Rod Tinnemore, Bob Lebens and Tom Morrissey (not present). Note: Lisa Rector is also a voting member.
- John Crouch noted he thought this [how to handle burn rates in the cordwood test method] is a fundamental question that the states need to decide. John explained that industry has some consensus about this issue already, as determined by the ASTM process. So, John noted that he hoped states/regulators could reach some consensus.
- Lisa asked Bob Ferguson to summarize for state regulators where ASTM is [on the burn rate issue] and why the ASTM group came to the conclusion they did.
- Bob Ferguson noted that he had hoped to provide cliff notes on burn rates to the WG, but he'd been unavailable/too busy recently. Bob had pulled together 25 separate meeting reports and documents all of which contain some information on burn rates, starting back in 2013 when ASTM initiated the cordwood test method (CTM) process. Prior to 2013, the CTM was an annex to the crib method (i.e., in ASTM E2780). In 2013, ASTM moved to develop a standalone method for cordwood. Bob noted that burn rate categories are a big part of that CTM effort and many approaches were proposed. Lisa Rector, John Crouch and Bob Ferguson will see if they can put a chronological summary together.
- Bob continued that one big change from having very specific burn rates defined in kg/hr was ASTM's move away from that to redefining the low burn specifically as representing an un-tended fire or overnight burn, with a minimum burn duration of 8 hours. ASTM's proposed CTM also recognizes that an 8-hour burn may not be possible for all stoves. Bob noted this was discussed over many meetings and it was concluded that an 8-hour burn would be the primary criterion, but that smaller stoves [not able to burn for 8 hours] would still have to meet a 1.15 kg/hr burn rate. Bob noted that ASTM also put an upper limit [of 1.5 kg/hr] on [the 8-hour burn] as well, because there was some concern that big stoves could have too high of a burn rate. All decisions were reached by discussion until consensus was achieved among ASTM's large diverse group.
- Bob noted that these ASTM discussions led to the minimum burn rate definition being tied into loading density (lbs/cubic ft) and also what the test load looked like, for the low fire test. ASTM

DRAFT February 22, 2016 --- Do not Cite or Distribute

was able to get some testing done in 2014 by Mark Champion and this testing was helpful in looking at all burn rate categories. Bob explained that, for a long while, burn rates had been looked at in the context of hot-to-hot tests (that is, starting and ending on a hot coal bed) such as in M28 and the current ASTM (E2780). But a paradigm shift occurred at the end of July 2014 when ASTM moved to introduce the cold start. This had an impact on how burn rates would be defined. So, Bob noted that he tends to consider [wood heater testing history] in terms of a pre-cold-start era and then a post-cold-start era.

- Regarding ASTM's high, low and medium fires: Bob explained that the high fire burn rate is straightforward: from a cold-start, the max air setting is used followed by slightly lower load of wood that's allowed to run until 90% of the fuel is burned. The low fire burn is a hot-start at a higher loading density at 12 lb/cubic feet and the low burn rate definition requires an 8-hour burn [not to exceed 1.5 kg/hr] or meeting a minimum burn rate [of 1.15 kg/hr]. The medium fire is defined to be less than 50% the difference between the high and low fire [burn rates], which puts the medium fire burn rate in the bottom half of the operating range. So, Bob concluded that those are the 3 [ASTM] burn rates.
- Bob had intended to create a summary from the 25 documents looked at, but he ran out of time, as it was not as straightforward as he hoped. Bob noted that ASTM's task group asked complicated questions about what they were really doing. When stuck, ASTM's prime directive was how to best simulate what people would do in their homes. A secondary consideration was guarding against creating too much variability in the method when deciding to take one course of action versus another. Bob pointed to the example of dividing a load into 3 sections and adding it in parts to simulate someone who wants a medium fire before bed, by putting logs in every 1 to 2 hours. Bob noted that all of this was addressed and discussed, but ASTM needed a means to judge if the task group was moving in the right direction. The information from Mark Champion's testing was used to assess whether or not the task group's proposals passed the reasonable test.
- Bob concluded that that's the quickest summary, but answering questions the WG has may be more informative. Bob again summarized that ASTM's CTM does assess using individual test runs, including a cold-start high fire, a low fire, and then a medium fire in the lower half of the operating range. So, Bob noted, ASTM's CTM does focus the weighting on the lower half of the operating range and, in conjunction with weighting, puts 80% [of test] in lowest two categories, where stoves are more sensitive to issues.
- Lisa thanked Bob for his summary and asked Bob if, for the ASTM method, the stove is tested at the lowest air setting for the low burn rate. Bob confirmed that was correct and clarified that the stove is tested at the lowest setting consumers can push the stove [controls] to. Lisa noted that this means essentially the manufacturer/stove model determines what the lowest air setting is [for ASTM's low fire test].
- John Crouch reminded the WG what Bob said regarding the ASTM task group wrestling with this issue – that is, how to avoid the manufacturer setting low at 50,000 BTUs, an absurd setting. To

DRAFT February 22, 2016 --- Do not Cite or Distribute

avoid this, the caveat in the method requires that, because of the higher load of cordwood (higher than the crib load), the stove needs to have a target of an 8-hour burn, since consumers expect this. John pointed out that this is an important caveat because, although the lowest setting is determined by the manufacturer/stove, the ASTM task group put some effort into bounding that low setting, so that it's consumer-friendly. Even with a big stove, the burn rate can't exceed 1.5 kg/hr at the low setting, at least as it's defined today. So, the stove must burn for 8 hours and not more than 1.5 kg/hr, or it has to burn at less than or equal to 1.15 kg/hr. In other words, there are still tight constraints on what that low burn rate can be.

- For clarification, Bob Lebens asked what "not higher than 1.5 kg/hr" meant. Bob Ferguson explained that a large stove that holds a lot of wood, with high BTU output or a high burn rate, can easily achieve an 8-hour burn that may have a 2.5 kg/hr burn rate at even the lowest air setting. Therefore, the ASTM task group recognized the need for a limit/cap on how high the low burn rate could be. The ASTM task group recognized, for example, that for a 4.5 cubic foot stove it should not be permissible to call 2.5 kg/hr that stove's low burn rate just because the stove was at the lowest air setting. The task group agreed that was too high a burn rate, even if the stove met the 8-hour primary criterion. Therefore, the task group included a reasonable not-to-exceed low burn rate of 1.5 g/hr; otherwise the stove would overheat people in their homes.
- Bob Ferguson further noted that another way to explain this was a graph he had previously prepared (that he could send out) to show this issue. If one does the math, it becomes clear that at a certain size firebox – and with a 12 lb/cubic ft load divided by 8 hours – a 2.5 kg/hr low burn rate can easily result. For small stoves, 2.5 kg/hr may be their max burn rate. Therefore, Bob explained, the ASTM Committee at the time didn't want to get away from the recognition that people often operate their stoves at lower burn rates and own stoves that, even if properly sized, would not be able to get down to the lower end of the burn rate range. Such a stove could achieve perhaps a 12 or 16 hour burn and meet the 1.5 kg/hr burn rate requirement. But, the ASTM Committee didn't want the minimum setting to be too high, just because the stove was large and could be loaded with a lot of wood.
- Lisa noted that the ASTM language requires both an 8-hour burn and that the device be set at the lowest burn setting. Lisa asked for confirmation that there's therefore no wiggle room for the manufacturer to set it higher than the lowest air setting. Bob Ferguson confirmed that was correct and noted that ASTM wanted it to be at a setting equivalent to what the consumer would do and so the requirement is to put the device at the lowest setting. Bob clarified that it's not appropriate to, for example, set the device at 1 inch open [for the low fire test] with a device that can go lower than that – as emissions would in that case not be measured as low as the device could go – even if that device could meet ASTM's burn rate criteria. Bob noted that this was discussed quite a bit [by the ASTM committee].
- Bob Ferguson further noted that the current M28 has an interesting "out" that hardly ever gets used. Bob explained that M28's low burn rate definition is less than 0.8 kg/hr, but any runs less than 0.6 kg/hr don't have to be counted. According to Bob, this recognizes that if the device can meet 0.8 with its air controls, then the requirement has been met, even if the air controls can go

DRAFT February 22, 2016 --- Do not Cite or Distribute

lower. But Bob noted that this “out” has hardly ever been used to his knowledge, and it’s confusing in the test method and regulatory language. So, ASTM’s requirement, on the other hand, is simply to turn the stove to its lowest air setting and that [by definition] is low. How much air that represents is up to the manufacturer but it does represent where the stove’s air is at its lowest setting from the consumer’s perspective. Bob noted that some of this discussion and resulting language is coming up on its 3rd or 4th year of existence and ASTM has moved onto other issues. But, Bob pointed out, ASTM was more closely tied into maintaining some connection to M28 and its burn rate definitions by not straying too far afield. For example, Bob explained that ASTM was never really at the point in the conversation then of proposing that low is whatever the manufacturer says it is; if the stove can only burn for 4 hours then the consumer will hate it and the stove won’t last long in the marketplace. Rather, ASTM recognized then a need to maintain some semblance of a defined low burn rate in the method.

- Lisa noted that describes ASTM’s low fire requirement and asked for confirmation that ASTM’s high fire requires the device to be on the highest air setting. Bob Ferguson confirmed that was correct, noting that high is the opposite end of the spectrum. The combustion air control must be at the max setting for the high fire.
- In response to Lisa asking Bob Ferguson to explain the medium burn rate more, Bob replied that the medium burn rate was an interesting problem and the reason ASTM ended up where it did was specifically because of the testing that Mark Champion did. Bob explained that ASTM proposed that the air control had to be at the point visually halfway or lower of the distance between the high and low air settings. Thus, ASTM proposed that the medium fire air setting would be a visual reference, with the air control placed in the middle of the operating range. Bob noted that many stoves at high typically operate at wide open and other categories all occur in bottom half or below of visual [halfway point in] range of controls. Bob explained what drove the definition [of medium fire]. When Mark Champion ran the high fire tests (from cold starts), the tests were cut-off at 90% because the long tails were doubling the length of the high fire test. Bob noted that in some cases there were 6-hour high fire tests because of this long tail. So, half of that time was burning the last 10% of the fuel. Bob explained that, interestingly enough, Mark Champion’s [and Ben Myren’s] analysis of the data showed that cutting-off the test at 90% fuel consumption will provide an appropriate high fire test and, by burning the remaining 10% at the exact same air setting, the stove happens to fall into ASTM’s definition of a medium burn rate.
- However, Bob explained that ASTM did some conceptual development to ensure that the medium runs would be run with the air control setting in the position of medium heat output, rather than merely meeting the burn rate criteria of being less than half the burn rate between high and low. Bob explained that ASTM wanted to avoid the medium burn rate being merely an artifact of a test method and rather be based on a physical action on the stove, to cause the stove to burn slower. Bob noted that there’s quite a bit of discussion in the ASTM reports regarding this. Mark Champion’s data was helpful in underscoring the need for specificity about how the medium fire is defined to ensure an air control setting is made and that the actual burn rate is achieved because that air setting was turned down. ASTM was trying to get the medium

DRAFT February 22, 2016 --- Do not Cite or Distribute

fire to be in the lower half of the operating range in recognition of the fact that people operate their stoves more often in the lower half than the upper half of the range.

- Bob noted there exists a no man's land where a medium test could be run and not make the burn rate criteria as defined, but rather end up too high, somewhere between what ASTM calls medium and high fire (that is, a "no man's land"). Bob explained that those tests have to be repeated with the air control set lower to ensure they meet the medium point. [Note that ASTM's 1-3-2017 draft CTM states the following regarding the *Medium Fire Test Combustion Air Control Settings* – *The primary combustion air control(s) shall be set at a position no greater than half-way between the lowest and highest primary air control settings as measured on the control actuator (lever, knob, etc.). The half-way setting may be a linear or angular position depending on the air control actuator. If the resultant dry burn rate is greater than the mid-point between the dry burn rates for the low fire and high fire test runs, the primary combustion air control shall be set to a lower position and the test run repeated.*] Bob further noted that ASTM's definition did accomplish the objective of ensuring that 2 out of the 3 burn rates were in the lower half of the appliance's burn capabilities – that is, one burn rate is the lowest and second is in the lower half of the burn rate capabilities of the appliance.
- Bob Ferguson opined that anything the O/F WG proposes will need to be confirmed by testing because of the possibility of unintended consequences, especially if the test runs will be ended prior to 100% of fuel consumption or have other definitions for the end of the test. The end of test definitions will all impact the category definitions. So, for instance, Bob noted, if all tests are going to be cut-off at 90% [of fuel consumed], then the 8-hour burn may have to be rethought, because a stove that could otherwise burn for 8-hours may not be able to do so if the test is cut-off at 90%. Bob noted that it's important to understand how elements of the test method are intertwined. The ASTM protocol as defined was exercised to the point where no unintended consequences were ensured. An example of this was the medium burn rate work [explained by Bob above], where the ASTM task group realized there could be an unintended consequence, depending on how the medium burn rate was defined and what was required in the test. Hence, the requirement of a physical change in the air control setting to a medium or lower position.
- Lisa noted that, based on John Crouch's introduction, it sounds like the industry is solidly behind this definition of burn rates. Lisa further noted that industry folks on the phone who disagree should feel free to contradict that claim. Lisa wondered what the regulators think – e.g., whether or not regulators have concerns about the ASTM method, or support a different burn rate definition/test method such as the two alternatives discussed last week. Lisa reminded the WG that the two burn rate definitions discussed last week are (1) burn rates being defined as a percentage of maximum burn rate, which is not a definition used with stoves to-date, but which has been used by CSA for central heaters; or (2) the burn rate definitions currently used in CSA as well as in M28 for the crib test.
- John Voorhees, calling at 1:30 in the morning from China, noted that he appreciated Lisa's effort. John commented, regarding whether or not industry is fully behind the current definition of burn rates [in ASTM's draft CTM], that he's not sure if the answer is yes or no. John opined

DRAFT February 22, 2016 --- Do not Cite or Distribute

that, regarding the low burn rate, industry felt that some kind of [specified] minimum low burn rate was needed because of EPA's perceived feelings and history behind M28. John noted therefore that it may be worth asking industry on the next call whether or not industry feels like they need to be saddled with a minimum burn rate. John noted that he's bringing this up in light of the knowledge he's gaining regarding European testing, where there is no specified minimum burn rate number. Rather, the minimum burn rate is determined by the lowest air setting on that particular stove. John reiterated that industry has been saddled with a minimum burn rate for over 30 years and perhaps it's time to consider whether the market should determine what the minimum burn rate is, rather than a technicality forcing the stove to burn at possibly an unrealistic number and produce more emissions.

- Bob Ferguson explained that ASTM uses a consensus process, so the end result was a compromise among all parties – that is, everybody got to the point where they could live with the end result, although it may not have been anyone's first choice. Bob explained that the end result was an interaction from different perspectives. Regarding the percentage approach to burn rates that Lisa Rector mentioned, Bob noted that ASTM put that into its original crib method, ASTM E2780, with the understanding that at that point in time EPA would not allow it [as a certification test method]. When ASTM moved onto the draft CTM, ASTM discussed it again in detail and got the same feeling from EPA – therefore, ASTM moved off it. Bob clarified that people are not unsupportive of the percentage idea. However, the current draft CTM [that does not include the percentage approach] resulted from a consensus process, in which common ground was sought.
- Lisa thanked Bob for that history and noted that, one of things that John Voorhees raised, is that the low setting requirement in the ASTM method includes a caveat. So, with respect to the ASTM method, there might be a question of whether that 8-hour burn rate time should remain. Lisa asked John if she was understanding him correctly – that is, she understands John to be supportive of testing at the lowest setting, but not supportive of also requiring an 8-hour burn.
- John Voorhees replied that perhaps neither a specific burn time or burn rate should be required. Thinking outside the box, John noted that he's wondering why parameters have to be put on the minimum burn rate. Rather, let the market decide that. John noted that, if a particular model of stove has a lowest air setting and that lowest air setting is used for the testing, perhaps it should not matter what that lowest burn rate time or burn rate is.
- Bob Lebens gave a different view. Bob Leben's general thinking is that the appliance needs to be tested in the range in which will be operated. In addition, Bob noted that what consumers are interested in are the BTU's delivered to the room. Bob Lebens further noted that the minimum burn rate limit of 1.5 kg/hour [explained by Bob Ferguson as ASTM's low burn rate cap] would seem to produce a fairly high level of BTU's, given the distribution of heat demand that people are looking for. Bob Lebens opined that, given that these are space heaters or essentially room heaters, that minimum setting [of 1.5 kg/hr], that heat demand/output, will drive people out of the room.

DRAFT February 22, 2016 --- Do not Cite or Distribute

- In response, Bob Ferguson explained that those numbers are stove size related and that [1.5 kg/hr] was for a large stove. That stove would have had to meet the 8-hour burn, but just couldn't go above the 1.5 kg/hr cap. Bob reiterated that that [large] stove would have made an 8-hour burn duration or longer, but couldn't go above 1.5 kg/hr. The 1.15 g/hr minimum burn rate cap is still in effect if a [smaller] stove can't make the 8-hour burn. Bob Ferguson noted that this is all about ensuring the stoves are properly sized to the size they're attempting to heat. Bob further noted that there are larger spaces being heated by a single stove and their heat demand is different than a small space heated by a small stove.
- Bob Lebens responded that he understood that and noted that, probably more important than the size question, is the fact that the most prevalent technology in use for certified appliances is non-catalytic technology that relies on secondary combustion air. Bob noted that, because of that, he understands it's a real challenge to produce clean burning stoves at the burn rate currently required by the NSPS. But, Bob Lebens further noted that he thinks there's good reason for that, honestly, because people do shut the stove down to produce the desired heat demand as well as to get an overnight burn. Bob Lebens opined that appliances really need to be challenged at those low burn rates, because it's difficult with lower combustion temperatures for those stoves not to produce a smoldering condition, at those low heat demands. Bob stated that he would challenge the industry folks that, because this is a performance-based standard and the technology currently [predominantly] adopted [non-catalytic] is really challenged in this area, the appliances really ought to be tested in a rigorous method, as they will be used in the homes, at low heat demands. Bob opined that he thinks there's good reason for the current low burn rate requirement. According to Bob, there's a distribution of heat demands out there that suggests that people will use the appliances at such low heat outputs. Bob noted that he knows it's a real challenge to get these appliances to burn clean at these low burn rates and so that challenge should be met by everyone cleaning up the appliances in that range in which they're used for heating.
- John Crouch responded that he didn't think anyone was suggesting they didn't want clean appliances. John noted that he didn't know how to respond because the implication of Bob Leben's comment is that industry doesn't want the appliances to be clean, or doesn't want to challenge them [with the test method]. But what Bob Ferguson went through is how industry – along with EPA and some states – after a lot of discussion came up with several things [in ASTM's method] which are much more relevant to how consumers use their stove than [what's required by] M28. First and foremost, John noted [that ASTM's method uses] a much heavier load of fuel, much heavier. The ASTM committee decided that when people burn their stoves overnight, they really pack it, so that load needed to be more. John noted next, regarding the assumption that people will always turn the stove down to their lowest setting, no one is arguing that it shouldn't burn cleanly at the lowest setting. John pointed out that ASTM set boundaries at what the lowest setting could be, so a manufacturer couldn't claim an absurdly high lowest setting (such as 50,000 BTUs). So, John concluded that no one disagrees with Bob Leben's fundamental concept.

DRAFT February 22, 2016 --- Do not Cite or Distribute

- Bob Lebens replied that people seem to have a problem with the current testing requirement of 1 kg/hr, since in this [ASTM] proposal it's 1.15 kg/hr and 1.5 kg/hr.
- Lisa clarified that right now, under M28's current burn rate, the minimum burn rate must be less than 1 kg/hr. However, Lisa asked for confirmation that, under M28, that might not be the lowest air setting. Bob Ferguson clarified that [at 1 kg/hr] it is the stove's lowest air setting and two runs are required. Bob noted that, that is the kick-out there, because the real burn rate is 0.8 kg/hour unless the stove can't meet 0.8 and then two Category 2 burns must be run. This is similar to what happens with hydronic heaters. So, Bob further clarified that 1 kg/hr is the defacto cut-off, but if that is the case, then the air setting has to be at the lowest setting.
- Bob Ferguson noted that he doesn't disagree with what Bob Lebens is saying. But, Bob Ferguson pointed out that an amazing shift is occurring going from crib loaded at 7 lb/cubic feet to cordwood loaded, in ASTM's method, at either 10 lb/cubic feet for high fire or 12 lb/cubic feet for low fire. Therefore, Bob noted that the burn rates that are relevant from EPA's M28 are totally irrelevant and the air settings are also totally irrelevant. Based on Bob's experience, there's a 50-50 chance that the stove's fire will go out when a stove that burns crib wood at a 1 kg/hr burn rate is loaded instead with 12 lb/cubic feet of cordwood at the same air setting. Such a load will require a completely different primary air setting to get the same burn rate. Therefore, Bob explained, anything the WG comes up with for the cordwood method has to be confirmed through testing, as it can't be assumed that what's relevant for crib applies to cordwood for certification.
- Bob Lebens responded that he can appreciate there will be these differences, but it's all about BTUs, as that's what the consumer is interested in. Therefore, Bob noted, that's an important comparison to look at.
- Bob Ferguson noted that he doesn't disagree and that ASTM did essentially look at ensuring that 2 of ASTM's 3 runs were in the lower half of the stove's operating range. And further that stoves have to be ~2.4 cubic feet before the 1.5 kg/hr cap would kick in. So, Bob explained, stoves smaller than 2.4 cubic feet are going to be living with [a low burn rate specification of] 1.15 kg/hr, whereas with M28 burning crib they'd have to meet 1 kg/hr. But, Bob again explained, it's an apples-to-oranges comparison based on what the testing revealed. Bob noted that his testing revealed (which Ben Myron would also confirm) that there are radical differences in what the stove's air settings will look like compared to today.
- Bob Lebens replied that while this may be the case, burn rate is burn rate; given the same efficiency that's going to be equivalent heat output. Going back to Lisa's question, Bob Lebens noted that if a stove can burn at lower than 1 kg/hr, then that's the minimum. Bob remarked that Bob Ferguson has noted in the past that manufacturers will mark the point at which the stove burns at 1 kg/hr and that's where the stove's stop will be. However, if the stove tests below 0.8 kg/hr, [the lowest setting] doesn't have to be at that stop.

DRAFT February 22, 2016 --- Do not Cite or Distribute

- Lisa Rector noted that she heard John Voorhees saying if someone wants to design a stove with a minimum burn rate that delivers 50,000 BTUs, then the manufacturer should be allowed to do that, that [the test method] shouldn't be putting these artificial constraints on the manufacturer. Lisa noted that she understands Bob Lebens's concern to be if a stove like that were sold, then the unit shouldn't be able to be operated below 50,000 BTUs, to use an extreme example. Lisa asked Bob Lebens if he was concerned that the homeowner would do something to modify the stove, in such case, to get a lower burn rate. Bob Lebens replied that yes, he was absolutely concerned about that.
- Lisa concluded that that's the crux of the issue that Bob Lebens is having. It's not that Bob is necessarily opposed to the philosophical idea of letting the manufacturer design. Rather, it's the practical concern regarding what the homeowner will do to get the stove to deliver a lower heat load – that consumers will modify the stove to get there anyway. Therefore, Lisa explained, the minimum burn rate should reflect this because, even if the stove is not designed to get to such a low burn rate, the homeowner will make the stove get there.
- Bob Lebens noted that this concern is still relevant. Bob also noted that there's lots of different variables to consider in the various test methods and that he's open to being persuaded that the minimum [burn rate] level ought to be different than it is. But, as Bob Ferguson pointed out, now we're dealing with cordwood not crib wood; so there are different elements of the test method that factor in regarding what an appropriate burn rate is/should be.
- Bob Ferguson noted that part of the problem, when comparing field performance to lab performance, is that the air setting used to achieve the 1 kg/hr burn rate based on crib wood burning becomes the permanent low air setting. This air setting may deliver emissions that are below the limit. But, as soon as cordwood is burned in this stove in the field at this low crib setting, that's where smoke/dirty burns happen. Bob explained that all of these stoves have a sweet spot where it doesn't matter if the stove is burning crib or cordwood. But, the low air setting is being defined based on burning crib wood at 1kg/hr. Then, when different fuel (cordwood) is used in the field compared to what was used in the lab, everyone's surprised that the same performance is not achieved in the field as in the lab.
- Bob Lebens responded that he can appreciate that, but he's not sure revising the minimum burn rate requirement slightly upward will solve that problem necessarily. Bob Ferguson responded that it may not solve the problem, but it's moving in the right direction from the perspective of making it more difficult for a homeowner to make a stove burn with crappy performance. Bob Ferguson noted that he can take both sides of this argument but concluded that the goal is to develop a more representative method that produces less surprises when moving from the lab to the field [in-home use]. Bob Lebens agreed, noting that's why it's good having these discussions regarding moving to cordwood.
- Lisa Rector noted it's important to hear from other state people and asked Cindy Heil, John Wakefield, Rod Tinnemore or Randy Orr to comment. John Crouch noted that he would like to put Rod Tinnemore on the spot, as Rod watched cordwood burn in and EPA-certified stove at

DRAFT February 22, 2016 --- Do not Cite or Distribute

the low burn setting (using a single-story stack, as typically used for testing in the lab) and Rod saw what happens with all that secondary air. John noted that Rod is one of few [state] people who saw what Bob Ferguson is referring to – that is, the amount of secondary air that the minimum burn rate on cribs requires and how that negatively affects cordwood burning.

- Rod Tinnemore replied that yes, without a doubt, a slightly higher air setting is needed in order to work with cordwood. Period; end of discussion. Rod noted that this is old news that he's tired of rehashing.
- Lisa asked Rod if he is comfortable with how ASTM has defined the burn rates and air settings. Rod replied yes, although he would also be comfortable with what John Voorhees is talking about it – that is, sticking with the lowest setting that a device is designed to achieve. Rod noted that he is still struggling with balancing the need of having a defined low burn rate setting as a bridge back to M28 versus the look to the future – that is, to have the burn settings follow the devices. Rod further noted that he didn't see the relevance of worrying about cheating when the device is tested at the lowest setting a consumer can use. Unless [the consumer does] something very unusual like adding a damper in the flue, [the consumer] will not be modifying that low burn rate on the device, because it can't go any lower.
- Lisa Rector noted that that's where I'm at too, noting she understands Bob Leben's concern [regarding consumer tampering], but [a consumer] could do that now – for example, take a stove with a 1 kg/hr minimum burn rate and make it burn at 0.5 kg/hr. There's a lot that can't be controlled once the device gets out in field. Rod agreed, noting that's less a practice now than it used to be.
- Cindy Heil noted that she too was leaning more toward what Rod Tinnemore just expressed.
- John Voorhees noted that he understands Bob Lebens' concerns, but it's pretty clear in the current [NSPS] requirements that you can't alter the damper or flue; it's not legal. John also pointed out that the argument flies in the face of single burn rate stoves, in which the burn rate is not adjustable and it's set where it's set. John opined that, based on what he's seen in Europe, the market should determine this, but the labeling needs to be clear (e.g., that the stove burns between here and there, based on the test setting or test load). Lisa Rector asked John to confirm if he was suggesting testing at the lowest air setting, but also have test requirement that allows consumers to see how long the burn time is for that lowest air setting. John Voorhees clarified that it should be reported. John proposed that it should be made clear to the consumer; the consumer shouldn't be deceived. The appliance should be required to be set at the lowest setting, but that lowest setting should be whatever the manufacturer decides/designs for that stove.
- Bob Ferguson noted that industry has always anticipated finally a common basis for labeling, regarding heat output and efficiency. Whatever labeling requirements are, Bob noted that minimum overnight burn duration is important and something consumers can understand.

DRAFT February 22, 2016 --- Do not Cite or Distribute

Consumers may not be familiar with g/hr ratings, but consumers would understand a 4-hour burn duration versus a 10-hour burn duration. John Voorhees heartily agreed.

- Randy Orr noted that this made sense, pointing to the US having gone through a history of automobiles being tested one way but having totally different results [in the field]. Randy noted that he thinks Bob Lebens is saying that the wood heater stakeholders don't want a wink, wink, nudge, nudge as has happened in the auto industry. But, Randy opined, if there's a lowest setting to the stove and it's posted on the tag, that should be fine – and the lowest level should be the level the stove is tested at.
- Bob Lebens noted that, when comparing labels, it's relative and under lab conditions. So, the labels would publish relative [lab-based] differences. But, Bob pointed out, there's very big differences based on in-home installation. The burn rates will differ a lot and so, for example, one of these stoves may have a published [lab-based] minimum burn rate on the tag that is quite different from how that stove will actually perform under in-home installation, because of draft conditions, etc. Therefore, Bob noted, the appliance should be put in, for example, a low draft situation to ensure clean burning in that situation, if at all possible.
- Lisa asked the WG if it was ready to take a vote, or if other items needed to be discussed first.
- Cindy Heil remarked that unfortunately she had to leave the call, but that she is leaning towards what Rod Tinnemore said. Cindy noted that the [cordwood method effort] is in a transitional period and that perfection can't be reached; but it's a start and the process is moving in the right direction. Cindy left the call at this point.
- John Crouch suggested clarifying the question regarding which options were being decided upon. Bob Ferguson noted that, for now, the WG could answer the question conceptually and getting that concept into workable language is important, especially regarding how to make any decision work without unintended consequences. For now, the question is what burn rate concept does the WG want to proceed with.
- Lisa agreed that only the concept was being decided today and listed the following 3 options:
 1. Let the manufacturers design the stove and test according to that design (i.e., the low burn rate is whatever the lowest setting and burn rate is for that specific stove, the highest burn rate is at the max air setting for that stove and the medium is in between);
 2. Specify burn rates with fixed numbers regardless of the individual stove being tested (i.e., define burn rates as M28 does); or
 3. Specify burn rates as a percentage of the maximum burn rate for that stove.

DRAFT February 22, 2016 --- Do not Cite or Distribute

Lisa noted that these are the 3 conceptual frameworks and once the WG knows where it wants to go conceptually, there will be details that will require further refinement. Lisa asked the WG voting members to voice their decision.

- Bob Ferguson clarified that ASTM's method uses a hybrid approach. Lisa agreed, noting that's why she didn't call it the ASTM approach, although the WG may later refine it and decide on whether or not, for example, ASTM's 8-hour burn idea should be used. But, for now, Lisa merely wanted to get a sense of where people are conceptually.
- The O/F WG voting members responded as follows:
 - Gregg Achman – let the stove define the burn rates;
 - John Crouch – seconded Gregg Achman;
 - John Voorhees – agreed stove should define the burn rates (#1 of Lisa's options);
 - Rod Tinnemore – also #1 of the options;
 - Cindy Heil – had indicated she agrees with Rod, so #1 of the options;
 - Randy Orr – also #1, but with the caveat that the burn rates and burn times must be expressly indicated on the label so the consumer understands and so that it will be blatantly obvious if "they're tricking it out on the burn rate". John Voorhees also agreed with this labeling requirement. Gregg Achman agreed 100% regarding labeling being important (both g/hr and burn duration) so consumers know what they're getting, similar to the city and highway mpg's being listed on an auto label.
 - Bob Lebens – there needs to be a minimum burn rate requirement [presumably #2 on Lisa's above list]. Bob explained that on their NSPS public comments, WESTAR was in support of what EPA ultimately established, but he realizes he's an outlier here.
 - Lisa Rector – agrees with Randy – so #1 on the list, but Lisa agrees that burn time and other information have to be provided to the consumer on the label.
 - Ben Myren – not present, Lisa will contact and obtain his vote;
 - Tom Morrissey – not present, Lisa will contact and obtain his vote;
 - Tom Butcher – not present, Lisa will reach out to and obtain his vote;
 - Lisa Herschberger – not present, Lisa will contact and obtain her vote.
- Lisa Rector noted that, in terms of process, there are 7 folks who want to move forward based on the design-based definition concept, while Bob Lebens wants a minimum burn rate, and 4 people are not present and haven't voted yet. Lisa noted that there is a majority in a certain direction, but need to hear from 4 more voting members. The process previously laid out is that the WG moves forward with the majority decision, but the minority position can be captured for presentation to EPA when the majority decision is presented to EPA. Lisa noted that therefore, there won't be a final vote until the remaining 4 voting members vote. The decision so far is to move forward with the burn rate definitions being based on the design of the stove.
- Lisa asked the group if it was ready to move forward with a discussion about ASTM's hybrid approach – that is, requiring the 8-hour burn or not requiring an 8-hour burn but instead

DRAFT February 22, 2016 --- Do not Cite or Distribute

requiring clear labeling. Lisa noted that there might be some third alternative, but those are the 2 refinements she has heard so far.

- Rod Tinnemore suggested tabling the refinement discussion for a future call. Gregg Achman seconded that. Lisa agreed to table that discussion.
- Lisa asked the WG if they wanted to have the next call on February 23rd, as scheduled, or since it's close to the start of the Expo, if the WG would rather reconvene on March 6th.
- Bob Ferguson noted that there are a few manufacturers who have a big responsibility about getting new products to show. Lisa agreed, noting she's cognizant of that and didn't want to divert from important activities that are underway for the Expo.
- John and Gregg noted that they were fine with either having the call on the 23rd or waiting until March 6th.
- Amanda Aldridge noted that she would hate to go a whole month without a call and suggested that the call on the 23rd be for one hour and focused on refinement. Amanda suggested that someone can summarize quickly and then focus the WG on refinement. Bob Ferguson opined that a 1-hour call is a good compromise and John Crouch agreed.
- Lisa noted that she liked the idea of 1 hour to focus on refinements. Lisa noted that one refinement to be discussed would be John Voorhees idea of removing the burn rate and time component versus leaving the requirement in. The refinements to the "definitional burn rates" – that is defining burn rates by stove design rather than by specified burn rates – will be discussed on the next call. Lisa further noted that she welcomes other ideas for a short-hand name, other than "definitional burn rates".
- Amanda wondered if perhaps John Voorhees could put the refinement down in writing, so people could read it before the call on the 23rd – perhaps just 3 sentences or so. John Voorhees agreed to write up 3 sentences. Lisa suggesting that John write up his proposal versus ASTM's, as the two options currently on the table for refinements.
- Bob Ferguson agreed that it'd be good to use ASTM as a starting point, rather than starting from a blank piece of paper. Bob Ferguson will send Lisa the current ASTM method as soon as he gets off the call. Amanda noted it would be good for everyone to see. Lisa Rector agreed to post ASTM's current method for everyone.
- John Voorhees will send his 3 sentences to Lisa Rector and John Crouch, in case they want to edit. Lisa will then post both to Basecamp.
- The WB will meet again in two weeks, on February 23rd.
- Thank you to all. Meeting adjourned.

Message

From: Jill Mozier [mozier.jill@ecrweb.com]
Sent: 2/4/2017 10:14:15 PM
To: Lisa Rector [lrector@nescaum.org]; John Crouch [crouch@hpba.org]
CC: Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Graham Fitzsimons [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=user1ff2e955]
Subject: Draft Meeting Notes from 1-26-17 O/F Teleconference
Attachments: Draft Operation Fueling Workgroup Meeting Notes from 1-26-2017.docx

Lisa and John,

Attached are the draft meeting notes from the 1/26/17 Operation and Fueling Workgroup meeting.

I have on my calendar that the next meeting is this coming Thursday (February 9th) at noon. My plan is to be on the call and take notes as usual. However, my husband is having surgery that day so there is a chance I will need to miss it. (But it's a long surgery and just up the road at Duke – so I can probably slip away for a couple hours.)

As a Plan B -- I'm wondering if Go-To-Meeting allows you to record the meeting. If so, one of you could send me the audio file afterwards and I could write up the notes from it. I don't think this will be necessary – as it will probably do me good to get out of the hospital for a few hours and so I hope to be on the call – but I just wanted to see if this is an option.

Can you record the meeting on Thursday, if necessary?

Thanks,
Jill

Jill Mozier
mozier.jill@ecrweb.com
(919) 433-8334
EC/R Inc.
Chapel Hill, North Carolina
A Wholly Owned Subsidiary of
SC&S, Inc.

DRAFT February 4, 2016 --- Do not Cite or Distribute

Operation and Fueling (O/F) Workgroup Meeting Notes from January 26, 2017 Teleconference

(Note: Voting Members are in bold-face)

Meeting led by **John Crouch** (HPBA, Co-Chair of O/F Workgroup) and **Lisa Rector** (NESCAUM, Co-Chair of Steering Committee)

Meeting Invitees (not necessarily all present): **Bob Lebens** (WESTAR, Co-Chair of Steering Committee), **Rod Tinnemore** (Washington) & **Phil Swartzendruber** (Puget Sound Clean Air Agency), **Marc Cohen** (Massachusetts), **Cindy Heil** (Alaska), John Wakefield (Vermont), **Lisa Herschberger** (Minnesota), Anne Jackson (Minnesota), **Randy Orr** (New York) & **John Barnes** (New York), Adam Baumgart-Getz (EPA OAQPS, Wood Heater NSPS Group Leader), Amanda Aldridge (EPA OAQPS, Wood Heater NSPS Lead), Stef Johnson (EPA OAQPS, Measurement Group Leader), Mike Toney (EPA OAQPS, Measurement Group), Bob Ferguson (Consultant to HPBA, President of Ferguson, Andors & Company), **Tom Butcher** (Brookhaven National Lab, BNL), Rebecca Trojanowski (BNL), Adam Bennett (BNL), **Gregg Achman** (Hearth & Home Technologies), **Allen Carroll** (Applied Ceramics), Rick Curkeet (Intertek), **Ben Myren** (Myren Labs), **John Voorhees** (US Stove), **Tom Morrissey** (Woodstock Soapstone), Dan Henry (5G3 Consulting), Mark Champion (Hearth Lab Solutions), John Steinert (Dirigo lab), Doug Towne (Dirigo lab), Gaetan Piedalue (Polytests lab), Jared Sorenson (OMNI lab), Sebastian Button (OMNI lab), Alex Tiegs (OMNI lab), Kelli O'Brien (ClearStak), Jeff Hallowell (Biomass Controls), Lee Mitchell (Applied Catalysts), Martin Morrill (Applied Catalysts), Jill Mozier (EPA contractor, meeting note taker)

Primary Conclusions from Meeting:

- The O/F Workgroup (WG) began discussing the 3 primary choices for defining burn rates:
 - Method 28's (M28's) four specified/fixed burn rate categories;
 - Defining burn rates as a percentage of the maximum burn rate. For example, Canadian Standard Association's (CSA's) option of defining burn rates as follows: CSA's Category 1 is < 35% of the max burn rate; Category 2 is ≥ 35% and <53%; Category 3 is 53% to 76% of max burn rate; and Category 4 is the max burn rate. It was noted that using a low burn rate defined as 35% of the max burn rate matches EPA's M28 low burn category well.
 - ASTM's method using 3 burn rate categories instead of 4, which was first used in the 2010 version of ASTM E2780. ASTM uses low, medium and high burn rates, with high burn ("high fire") being the max burn rate the stove can achieve and low burn ("low fire") being defined as follows in ASTM's method: Low Fire = minimum 8 hours burn duration but with a burn rate not to exceed 1.5 kg/h. If the model can't meet the 8 hour burn duration, the minimum burn rate must be ≤ 1.15 kg/h. So, no Low Fire Burn rate can exceed 1.5 kg/h and small stoves that can't make the 8 hours must have a Low Fire burn rate at 1.15 kg/h or less. For ASTM's low fire, the air settings have to be at their lowest setting (which is the same as in M28, except that in M28 the stove must not exceed a burn rate of 1 kg/hr). In addition, it was noted that ASTM's 40/40/20 weighting scheme for the 3 burn rates largely agrees with EPA's 4 burn rate weighting in M28.

DRAFT February 4, 2016 --- Do not Cite or Distribute

- If the WG decides to move from 4 to 3 burn rate categories, it is important to determine what data EPA needs to bridge the gap to enable compliance determination.
- The key question the decision on burn rates hinges on is: should the test method set design parameters or should the test method challenge the unit to burn cleanly, as designed.
- There was general consensus among the WG to discuss the topic of burn rates further on the next call in February and seek to come to a decision regarding which of the 3 burn rate options (bulleted above) the proposed cordwood test method should use.

To-Do List:

- Lisa Rector will determine via e-mail with WG members if a face-to-face meeting is possible at HPBA's Expo (as an alternative to the previously discussed Tuesday meeting, which is not possible).
- WG members interested in providing suggestions for NESCAUM's proposed sampling protocol for upcoming testing by Mark Champion, regarding different operation protocols, should e-mail Lisa Rector.
- Bob Ferguson will post additional information/data to Basecamp regarding looking at the EPA database from the perspective of CSA's burn rate percentages.
- The WG should frame any remaining questions regarding burn rates in writing and post the questions to Basecamp, so that others can see and look for responses.

Highlights from Meeting:

- Lisa Rector opened the meeting and noted that the following people were in attendance: George Allen, Gregg Achman, Bob Lebens, Cindy Heil, John Voorhees, Kelli O'Brien, Gaetan Piedalue, Randy Orr, Rick Curkeet (note: Rick announced he has retired from Intertek; Rick said Lisa should reach out to Intertek if the O/F work group wants a representative from Intertek), Robert Ferguson, John Wakefield, Amanda Aldridge, Rod Tinnemore, Lisa Herschberger, as well as others who did not announce themselves.
- Lisa opened the meeting noting that the agenda for today's call includes administrative updates, a recap of the operational protocol discussion, and a discussion regarding burn rates. It will likely be a short call today. Regarding administrative updates for people attending HPBA's Expo in Atlanta, Lisa noted that the proposed meeting on Tuesday will not work, as not enough people can attend. It is not clear how many people from the States can attend the Expo, but Lisa may have a better sense of that next week. If a face-to-face meeting happens at the Expo, Lisa noted that it may happen on Thursday or Friday. Lisa will nail this down via e-mail. There were no further questions on the Expo or administrative updates.
- Lisa began recapping the operational protocol discussion from the last meeting. The O/F work group (WG) had talked about the idea of moving into integrated/composite runs rather than the hot-to-hot run in Method 28. Lisa noted that they were contemplating NESCAUM having funding to support testing at Mark Champion's lab to examine different operational protocols. Lisa is in the process of preparing a sample work plan for this, including running multiple loads at the

DRAFT February 4, 2016 --- Do not Cite or Distribute

same burn rate and also varying operations within a single test run. Lisa asked that anyone interested in providing feedback on the sample test plan to please e-mail her with their suggestions regarding drafting the sampling protocol.

- Lisa launched the discussion regarding burn rates, that had begun during the last WG call. Lisa noted that ASTM has moved away from [Method 28's] previous definition of burn rates. Lisa put the following CSA B415 burn rates on the screen, noting that CSA 8.2.3 is the same as Method 28. **Note:** *Rick Curkeet later clarified that the following CSA slide refers to year 2000 definitions [and CSA section locations] of burn categories, not the most recent 2010. In the 2010 version, there is no "5.3 or less" caveat [and these burn rate categories are located in CSA Section 7.1.4.2]. Rick further clarified that the default burn rate categories under the 2010 CSA B415 are [located in Section 7.1.3] as follows: Category 1 is < 35% of the max burn rate; Category 2 is ≥ 35% and <53%; Category 3 is 53% to 76% of max burn rate; and Category 4 is the max burn rate.* Amanda confirmed that as well. Lisa apologized for her outdated slides.

CSA B415 Burn Rates

8.2.3

For appliances having a maximum burn rate at or below 5.3 kg/h, one emission test run is required in each of the following burn-rate categories (rates in kg/h dry basis):

Category 1	Category 2	Category 3	Category 4
<0.80	0.80 to 1.25	1.26 to 1.90	Maximum rate 5.3 or less

8.2.4

For appliances having a maximum burn rate above 5.3 kg/h, one emission test run is required in each of the following burn-rate categories:

Category 1	Category 2	Category 3	Category 4
<15% of maximum	15% to 24% of maximum	24 to 36% of maximum rate	Maximum rate

- Lisa noted that while [the above] are the published burn categories, Method 28's Category 1 is often below 1.0 kg/hr [rather than below 0.80 kg/hr as listed] because that's allowed as an alternative [if below 0.80 is not achievable on the stove].
- Bob Ferguson noted that origin of the 4 burn rates goes to Oregon Method 7, developed by OMNI 35 years ago, for Oregon DEQ. Bob explained that the concern then was that most people were operating their stoves at very low air settings; hence the emphasis on low burn rates. The Oregon DEQ took off followed by Colorado and that database became the basis for the original NSPS which was a regulatory-negotiation (or "reg-neg"). Bob noted that CSA B415 was just the Canadian version of M28. In 2010, CSA added central heaters (mainly warm-air furnaces) including the CSA B415 option that uses percentages of max burn rates. Bob explained that it was identified that having a prescribed fixed low burn rate pushed the designs in ways that were

DRAFT February 4, 2016 --- Do not Cite or Distribute

only there to meet testing requirements. CSA had a different idea –that is, that the low burn rate could be a fraction of high burn rate rather than a fixed number.

- Bob continued that, the reason the >5.3 kg/hr was in the CSA regulation, was to be consistent with hydronic heater regulations. When ASTM looked into redoing M28 in 2009, there was a lot of discussion about whether 4 burn rates were necessary. ASTM ultimately determined that 3 burn rates were adequate to define performance across the range and [going to 3 burn rates] cut out an unnecessary test to reduce cost and allow an extra run. Bob noted that he has put a lot of that historical data up on Basecamp, which shows what happens when using 3 burn rates.
- Bob subsequently clarified (via e-mail to Jill Mozier) that moving from 4 to 3 burn rates happened in the 2010 version of ASTM E2780 (the updating of EPA M28) and ASTM did a lot of analysis to understand the impact of eliminating one burn rate. There was full support for moving to 3 burn rates, including from EPA at the time, according to Bob, because the extensive data analysis was quite convincing. Bob further noted that the move to 3 burn rates was tied directly to a change in the way the data is weighted. It is the combination of the two that makes it all work
- Bob continued that, in addition to getting to 3 burn rates, the ASTM method allows the use of a percentage of the max burn rate – e.g., ASTM uses 35% of high burn rate to define the low burn rate and thereby allows getting over 1 kg/hr at this low end. Bob explained that ASTM's low burn category recognizes that for a large unit, sized right, the low burn rate will be higher than 1 kg/hr. Bob noted however that even though EPA was accepting of [this] low burn rate, the Agency was still tied into [their defined] low burn rates. Bob pointed to a paper by Dr. Houck that looked at that disconnect, and ASTM ultimately increased its minimum burn rate from 1 to 1.5 kg/hr. EPA has still been requiring a burn rate under 1 kg/hr on crib, however.
- Regarding a cordwood method, Bob noted that ASTM started thinking differently of test runs. Bob noted that he had located the mini reports from ASTM on this topic and can probably post them to Basecamp. Bob opined that it's great that the O/F WG is looking into how to define burn rate categories again. Bob noted that ASTM's idea for a low minimum burn rate was to allow for/represent an overnight burn rate. ASTM defined the overnight burn rate as an 8-hr burn rate – and for most stoves, that aren't small, this is not a problem. Bob clarified that the 8-hr burn means large stoves can get an 8-hr burn with something above 1, up to 1.5 kg/hr. But ASTM recognized that some small stoves cannot meet/achieve an 8-hr burn and therefore these stoves still are required to meet a minimum of 1.15 kg/hr. Bob explained that ASTM formulated it this way because ASTM wanted to define separate definable burn rates and take away the arbitrary fixed minimum burn rate. Bob pointed out that this was sort of what CSA was doing when they used a % of the max burn rate. ASTM tried to do this as well and then took it a step further by redefining these burn rates.
- Bob subsequently clarified (via e-mail to Jill Mozier) that CSA based the burn rate categories on % of maximum burn rate without other conditions. For stoves, the minimum burn rate must be 35% or less of the maximum. So, minimum burn rates start to climb above 1.0 kg/h (the current

DRAFT February 4, 2016 --- Do not Cite or Distribute

M28 requirement) when the maximum burn rate is above 2.86 kg/h. If the maximum burn rate is 4.0 kg/h, the model must only achieve a minimum burn rate of 1.4 kg/h or less. This does level the playing field by recognizing that larger stoves are intended to heat larger spaces and the need to force a burn rate of 1 kg/h or less is not a fair requirement. ASTM backed off the % based burn rate definitions when it was obvious that there was not consensus (at that time, at least) to move in that direction.

- Bob continued that ASTM calls it a “low fire” test and there’s a time requirement (8 hours). If the stove (e.g., some small stoves) can’t meet/achieve the time requirement of 8 hours, then there’s a burn rate limit (of 1.15 kg/hr) that must be achieved. Bob noted that the cap is 1.5 kg/hr for a stove that can burn for 8-hours; and if the stove that can’t meet the 8-hour time requirement, then the burn rate may not exceed 1.15 kg/hr for ASTM’s low fire test.
- Bob noted that there was an evolution ASTM went through – going from 4 to 3 burn rates was based on crib data and on EPA’s certified database. ASTM then moved to cordwood and redefined burn rates, but still require stoves to be tested at the maximum and minimum air settings and also at a medium burn rate – which ASTM defined as in between the max and min, but in the lower half of that range.
- To aid the discussion, Lisa put the following slides on the screen during Bob’s explanation –

ASTM High Fire

9.5 High Fire Test Category

9.5.1 Start-up Conditions – Appliance operation for the high fire test category employs a cold start. The average heater surface temperature per 9.2.2 and flue-gas temperature per 9.2.4 at the start of the test run shall be less than 10°F, (5°C) above ambient.

9.5.2 High Fire Test Primary Combustion Air Control Setting – The primary combustion air control(s) shall be at the highest setting(s) at all times during the high fire test run.

9.5.3 Other manual air control(s) shall be set at the position(s) in accordance with the manufacturer’s written instructions. Automatically operated controls shall be allowed to operate as designed.

-

DRAFT February 4, 2016 --- Do not Cite or Distribute

ASTM Draft – Low Fire

9.7 Low Fire Test Category

9.7.1 Low Fire Test Combustion Air Control Setting – For the low fire test run, the combustion air control(s) shall be set at the lowest airflow position and must result in a burn duration of at least 8 hours or a minimum burn rate less than or equal to 2.54 lb/h (1.15 kg/h) dry basis. The duration of the test is defined as the period of time from the beginning of the load time per 9.6.5 to the test run completion defined by 9.6.12. When the 8 h minimum burn duration criterion is used, the minimum burn rate shall not exceed 3.31 lb/h (1.5 kg/h) dry basis.

9.7.1.1 The primary combustion air control(s) shall be at the lowest setting(s) at all times during the low fire test run except as allowed by 9.6.5, 9.6.6 and 9.6.7.

9.7.1.2 Other manual air control(s) shall be set at the position(s) in accordance with the manufacturer's written instructions. Automatically operated controls shall be allowed to operate as designed.

- Regarding the above low fire slide, Bob noted that the low fire definition is close to final, but is missing one sentence from the final version. Bob clarified that ASTM's Low Fire = minimum 8 hours burn duration but with a burn rate not to exceed 1.5 kg/h. If the model can't meet the 8 hour burn duration, the minimum burn rate must be ≤ 1.15 kg/h. So, in other words, no Low Fire Burn rate can exceed 1.5 kg/h and small stoves that can't make the 8 hours must have a Low Fire burn rate at 1.15 kg/h or less. Bob noted that the air settings have to be at their lowest setting (which is the same as in M28, except that in M28 the stove must not exceed a burn rate of 1 kg/hr). Bob further noted that some stoves have secondary air controls and the ASTM method allows those to be set as the manufacturer recommends; automatic controls are also allowed to operate as recommended.
- Bob noted that ASTM had a wide variety of people and opinions on this topic and realized that they had to try to link back [any changes] to the existing database. As such, ASTM didn't want to take giant steps away from the Oregon database and what EPA was comfortable with. Therefore, Bob explained that ASTM took smaller steps along the way rather than one big step at once, because ASTM couldn't garner support of all stakeholders and of the EPA if large steps were taken.
- Lisa Rector noted that the O/F WG needs to make a decision ASAP regarding these two very different approaches [to burn rates]. In M28, the burn rates are specified/fixed. In ASTM, the high burn rate is the high air setting, the low burn rate is the low air setting, and then the medium burn rate falls in between of low and high. Bob Ferguson added that ASTM still put conditions on those general categories – that is, if the stove can't meet the 8-hr burn (with the not-to-exceed burn rate cap of 1.5 kg/hr), then the stove must not exceed a 1.15 kg/hr burn rate. In this way, it's a bridge backwards [to the existing database] too, Bob explained.

DRAFT February 4, 2016 --- Do not Cite or Distribute

- Lisa Rector underscored, however, that the ASTM method moves from 4 to 3 burn rates and specifies test parameters rather than design parameters. So, it's a change in philosophy. Lisa noted that the WG needs to understand where the state regulators are on this philosophical discussion. Lisa observed that industry and labs are behind the ASTM method; but the WG needs to know how many states are also comfortable [with ASTM's approach] so the work can proceed. Lisa emphasized that this decision is critical in order to proceed. Lisa noted that EPA is still fairly wed to 4 burn categories. If this group recommends 3 burn rates then it's important to understand what research EPA needs, that it doesn't have already, in order for the Agency to become comfortable with 3 burn rates. Lisa asks if there was anyone in the WG who wants to stick with 4 burn rates.
- Randy Orr replied that how [the stove] tamps down needs to be captured, noting that start-up has the highest emissions and 3 burn rates might be fine. However, perhaps the dampers should be closed, not open.
- Bob Ferguson noted that the burn rate categories and the way emissions are averaged are inextricably linked. Therefore, ASTM also looked at weighting schemes and moved away from EPA's probabilistic weighting scheme, which is complicated. ASTM looked at how to weight the burn rates in its method. Bob explained that ASTM's weighting puts 80% toward the lower end of burns and that's very similar to EPA's certified stove data. ASTM's 40/40/20 weighting scheme for the 3 burn rates has a lot of agreement with EPA's 4 burn rates. Bob noted that it's important to look at the weighting of burn rates to determine how it compares to EPA's current M28 weighting. Bob reiterated that burn rates and weighting are linked. Randy Orr replied that he would think about it further.
- Lisa Rector remarked, regarding the low burn rate, the air setting should be at low air flow. Lisa noted that there's start up and then high emissions over a long time due to less than ideal burn conditions, in order to get to an 8-hour burn. Lisa further noted that moving to 3 burn categories seems to make sense and explained that NESCAUM mined [burn rate] categories 2 and 3 and found the closest alignment in those two categories. Lisa commented that something will have to be given up, but it's difficult to provide sufficient information to EPA to determine compliance. Lisa explained that EPA must be given a dataset that shows that moving from 4 to 3 burn categories is enough to determine compliance. ASTM has probably done a lot, but Lisa noted that the WG will need to speak with Stef Johnson and Mike Toney to figure out what EPA needs to be more comfortable [with 3 burn rates instead of 4].
- Bob Ferguson explained that ASTM looked at Category 1 plus 2 and Category 1 and 4 together, and all of that information/analysis is posted. The correlation between M28 and the 3 burn rates can be examined. Bob noted that this work was done 7 years ago, in conjunction with going from M28 to E2780, which was ASTM's crib method with a cordwood annex. Bob further noted that Gil [Wood of EPA] was very involved. There's a good track record and the information is there, if someone wants to re-analyze the data. Bob noted that he had already analyzed data from 100 or so stoves and, in those results, one can see that there are some differences when

DRAFT February 4, 2016 --- Do not Cite or Distribute

you have stoves with unusual emission profiles – that is, stoves with big changes from burn rate to burn rate, a radical slope up or down. Bob explained that, for those stoves with emission profiles that are more level (less changing/radical), the weighting scheme becomes much less sensitive. Out of 140 stoves, those with changing/radical slopes from burn rate to burn rate were farthest away from equivalent numbers; but there were a whole bunch of stoves which were nearly identical. Bob concluded that the weighting doesn't matter at all for stoves with flatter emission profiles.

- Rick Curkeet noted that the CSA B415 fuel section allows for either cordwood (with specifications similar to ASTM specifications) or crib wood as an option. Rick explained that CSA B415 allows a test to be run using M28 burn rates and crib wood fuel crib, so it's compatible with the existing EPA requirements; but it also has other options using cordwood for stoves certifying only to CSA.
- Lisa Rector pointed out that there are essentially 3 choices: burn rates based on a % [of the max burn]; using 3 burn rates [as ASTM uses]; and using the 4 M28 burn rates. Rick agreed that was correct and explained that the reason 35% was chosen is that if you calculate actual percentages from EPA's database regarding what percentage low is of high, 90% of the stoves in the database have low burn rates that are between 30 and 35% of their max burn rate and the average is 31%. So, Rick concluded, using 35% of max burn rate [for the low burn rate] would match the EPA categories.
- Lisa Rector noted that she had to leave the call shortly and asked how people in the WG wanted to move forward with deciding these burn rate categories. Lisa asked if people needed more technical data to decide or if they had enough data already.
- Bob Lebens remarked that WESTAR had advocated for a low burn rate requirement in their NSPS comments, so maybe more information is needed. Bob noted that, as we try to make the test method more reflective of how units are operated, maybe we need to look again at the low burn rate. Bob wondered if it is a heat load issue and opined that these units do need to be challenged at low burn rates because that's where they are dirtiest and the controls are least effective.
- John Voorhees noted that the reason [stoves] have low burn rates is because it's required [in M28]. John wondered therefore if a stove needs to be turned down that low. John asked: If a stove can only be turned down to 1.5 [kg/hr burn rate], why does it have to be tested lower than that?
- John Wakefield pointed out that that [burn rate] may be the lowest a stove can go on a full load of wood, but it could go lower with a partial load. John asked however, why a manufacturer is forced to go lower on a full load.
- Bob Lebens noted that he was mindful of time and that this topic probably needs to be discussed in more depth, as there are a number of ways to look at this problem.

DRAFT February 4, 2016 --- Do not Cite or Distribute

- John Voorhees agreed, noting to Lisa Rector that it should be an action item for the next call. Lisa agreed that was a great idea, noting that this issue is a key question – that is, should the test method [essentially] be setting design parameters or should the test method be challenging the unit to burn cleanly as designed. John Voorhees replied “Exactly.”
- Rod Tinnemore noted that he agreed the test method needs to move beyond the constraints that were put on. Rod further noted that he is not sure why EPA went that route but maybe stoves were highly adjustable back then. Now, however, Rod opined that stoves should not be pushed to run/burn where they can’t run/burn. Rod noted he would like the WG to discuss this issue.
- Cindy Heil also commented that she would like to talk about this topic [on the next call] as well.
- Lisa Rector asked the WG if it needed more information or if members had enough on Basecamp already to review and be prepared for the next call. Lisa asked the WG if it could discuss and decide this issue on the next call.
- John Voorhees replied that the WG should aim for both a discussion and decision on next call.
- Lisa Rector noted that she and John Crouch could outline the 3 approaches discussed on the call today and point folks where to get more information. WG members should bring their thoughts and [on the next call] a pulse of the room will be taken to see if we have consensus and can move forward.
- Bob Ferguson noted that he had additional information that is not posted to Basecamp, including looking at the EPA database from the perspective of CSA’s percentages. Bob offered to post this to Basecamp.
- Lisa Rector noted that she had to leave the call, but this discussion could continue on the WG’s next call in February.
- John Crouch noted that the WG needs to frame any remaining questions in writing. As homework over the next 7 days, John asked that WG members frame questions and post them to Basecamp in writing so that others can see and look for responses.
- Bob Ferguson noted that he could point people in the right direction, if there are very specific things that people need to see and can’t find them on Basecamp. John Crouch agreed and encouraged people to ask Bob Ferguson for specific information, as there has been an avalanche of material on this topic since 2009. So, WG members may need a guide through the material.
- Bob Lebens agreed that more discussion on this topic is needed, noting that consensus may not be reached, but it’s worth talking about more.

DRAFT February 4, 2016 --- Do not Cite or Distribute

- John Crouch agreed to have further discussion on the topic and noted that nothing more is left on the agenda for today's call. The WG will meet in 2 weeks at noon to discuss this topic.
- Thank you to all. Meeting adjourned.

Message

From: Lisa Rector [lrector@nescaum.org]
Sent: 6/8/2017 12:09:41 PM
To: 'crouch@hpba.org' [crouch@hpba.org]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]
Subject: another discussion item
Attachments: donation letter rough draft v1.docx

John and Adam, I would like to add another item to the discussion list for tomorrow - donation of stoves for cordwood protocol testing. I think the plan is to start testing at HLS at some point in late July. I think we need to reach out to manufacturers ASAP to determine if there is interest in donating stoves for the work. John I believe you went through a similar exercise with the ASTM testing work that Mark did - is that correct? Your thoughts and input would be greatly appreciated. I would also like to discuss how we reach out to folks about this effort. To jump start the discussion, I drafted a letter with brief outline of NYSERDA work but I know we need to discuss how to reach out with this request and if we are going to use a written document, the one attached needs EPA and HPBA input before it goes out.

Lisa Rector, Senior Policy Analyst
NESCAUM
802-899-5306
lrector@nescaum.org

TO: ????

FROM: ????

RE: Donation of Wood Stoves for Research Effort

DATE: June X, 2017

Commented [LR1]:

DISCLAIMER – this needs input from HPBA and EPA to ensure this letter represents all

Commented [LR2]: HPBA, EPA, NESCAUM????

In August 2014, the Hearth Patio and Barbecue Association (HPBA), the Northeast States for Coordinated Air Use Management (NESCAUM) and the Western States Air Resources Council (WESTAR) presented consensus recommendations to EPA on the subject of test methods for wood-burning residential heaters. One such recommendation was: “Wood heater emission limits should be based on tests that correlate better with actual in-use emissions than the current test. There is a common interest among the parties to transition from the current crib-based wood heater certification test to a cordwood-based certification test by first establishing appropriate and efficient test methods, then using those methods to build a robust database to inform EPA’s determination of BSER for wood heaters based on cordwood testing.”

In EPA’s 2016 discussion paper, EPA indicated their intention to propose cordwood test methods in 2019. Funding has been secured to conduct research at Hearth Lab Solutions (HLS – Mark Champion’s lab) over the next year to inform that rulemaking. The purpose of this research is to develop foundational research on the impact of various fueling and operational protocols. We are reaching out to you to see if your company is willing to donate an EPA certified wood stove(s) for this research effort. Model and manufacturer information for appliances donated to this research effort will be held confidential, as the work under this effort is to characterize test protocol performance rather than stove performance. The research will require 6-8 stoves that represent different technology approaches and firebox sizes. Testing will include baseline testing similar to Method 28, (which will not be compared to certification results and this work cannot trigger an audit test), and iterative research testing that will inform the viability and impacts of changing fueling and device operation protocols. Data will be de-identified (stove A, stove B, etc.) and categorized by size (large, med, small) and control type (non-catalytic, catalytic).

Commented [LR3]: Should we note the source of funding – NYSERDA, EPA

For companies willing to participate in this effort, we plan to require non-disclosure agreements between the participating parties to ensure confidentiality. At the same time we are soliciting companies willing to donate stoves, a workgroup consisting of government and industry representatives will develop a list of stove parameters that each of the stoves chosen for the testing should represent. Once a list of companies willing to donate stoves and the stove parameter list has been developed, HLS will work with companies to identify appropriate and available stoves for the research effort. We would like to identify companies willing to partner in this effort by July 1, 2017.

Message

From: Rachel Feinstein [feinstein@hpba.org]
Sent: 4/21/2017 9:40:16 PM
To: Gunasekara, Mandy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=53d1a3caa8bb4ebab8a2d28ca59b6f45-Gunasekara,]
CC: Chung, David (DChung@crowell.com) [DChung@crowell.com]; Patrick Rita [prita@orionadvocates.com]
Subject: Hearth Industry Meeting Thanks and Follow Up
Attachments: HPBA One-pager (Apr 2017).pdf

Hi Mandy,

Thank you for taking the time to meet with us yesterday to discuss the NSPS for New Residential Wood Heaters, New Residential Hydronic Heaters and Forced-Air Furnaces. Attached you'll find the one-pager we provided you with during our meeting. It was great to hear that you're enjoying the new position and find the work to be rewarding.

Regarding your data request, if we send you that information in one month or in one month and a half, would that match your timeline?

Thanks again, and have a great weekend!
Rachel



Rachel Feinstein | Manager – Government Affairs
Hearth, Patio & Barbecue Association
1901 North Moore Street, Suite 600 | Arlington, VA 22209
OFFICE: 703-522-0086 x 109 | **MOBILE:** 703-828-4724
[Visit us online today!](#) | feinstein@hpba.org

Message

From: Rachel Feinstein [feinstein@hpba.org]
Sent: 4/12/2017 12:08:13 AM
To: Gunasekara, Mandy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=53d1a3caa8bb4ebab8a2d28ca59b6f45-Gunasekara,]
Subject: Re: Wood Heater Rule Meeting Request

Hi Mandy,

No problem!! Next Thursday, 4/20 at 10:00 am works for us. Pat Rita and David Chung (counsel) will also attend. Please let me know if you need any additional information from us beforehand.

Thank you,
Rachel

Rachel Feinstein
Manager - Government Affairs
Hearth, Patio & Barbecue Association (HPBA)
1901 North Moore St | Suite 600 | Arlington, VA 22209
E: feinstein@hpba.org
Work Ph: 703-522-0086 ext. 109
Cell Ph: 703-828-4724

From: Gunasekara, Mandy
Sent: Tuesday, April 11, 7:34 PM
Subject: Re: Wood Heater Rule Meeting Request
To: Rachel Feinstein

Hi Rachel, sorry for delayed response. Would next week work? I'm free Thursday (4/20) from 10 to 1 pm.

Sent from my iPhone

On Apr 11, 2017, at 11:13 AM, Rachel Feinstein <feinstein@hpba.org> wrote:

Hi Mandy,

I hope all is well on your end. Any chance we could schedule a meeting for this month or next?

Thanks,
Rachel

Rachel Feinstein
Manager - Government Affairs
Hearth, Patio & Barbecue Association (HPBA)
1901 North Moore St | Suite 600 | Arlington, VA 22209
E: feinstein@hpba.org
Work Ph: 703-522-0086 ext. 109

Cell Ph: 703-828-4724

On Thu, Apr 6, 2017 at 3:52 PM -0400, "Rachel Feinstein" <feinstein@hpba.org> wrote:

Hi Mandy,

Just following up on this. Any chance you have some time to meet this month?

Best,

Rachel

<image001.png>

Rachel Feinstein | Manager - Government Affairs

Hearth, Patio & Barbecue Association

1901 North Moore Street, Suite 600 | Arlington, VA 22209

OFFICE: 703-522-0086 x 109 | **MOBILE:** 703-828-4724

Visit us online today! | feinstein@hpba.org

From: Rachel Feinstein
Sent: Wednesday, March 29, 2017 2:53 PM
To: Gunasekara.mandy@epa.gov
Cc: Ryan Carroll (carroll@hpba.org); 'Patrick Rita'
Subject: Wood Heater Rule Meeting Request

Hi Mandy,

Per our conversations during your time with EPW, we're currently involved in litigation against EPA challenging portions of its Clean Air Act standards for residential wood heaters. We (and other parties to the case) spent roughly one year negotiating with the prior administration in attempts to resolve our challenge out of court, so that litigation was temporarily put on hold. Despite those attempts, the prior administration abruptly cut off the negotiations in August 2016 and basically told us they'd see us in court. At the beginning of this year, the court set a briefing schedule for the litigation, but it recently granted us a 90 day extension of all deadlines, making our first brief due June 26 of this year. Our lawsuit focuses almost entirely on "Step 2" of EPA's rule (set to take effect May 15, 2020). This is a rule that regulates mostly small businesses who sell to largely rural customers that cannot afford to purchase wood burning appliances that cost several thousands of dollars, which is where the industry may be headed to comply with the 2020 standards.

We continue to believe that there are several aspects of the 2020 standards that will be difficult for EPA to defend and that it is both of our interests to avoid litigation and instead try to reach an out-of-court resolution. When you have time in your schedule, may we meet with you to discuss what EPA could do to ease some of the looming regulatory burdens on the wood heater industry?

Thank you for your consideration,

Rachel

<image001.png>

Rachel Feinstein | Manager - Government Affairs

Hearth, Patio & Barbecue Association

1901 North Moore Street, Suite 600 | Arlington, VA 22209

OFFICE: 703-522-0086 x 109 | **MOBILE:** 703-828-4724

Visit us online today! | feinstein@hpba.org

Message

From: Rachel Feinstein [feinstein@hpba.org]
Sent: 4/11/2017 3:12:58 PM
To: Gunasekara, Mandy [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=53d1a3caa8bb4ebab8a2d28ca59b6f45-Gunasekara,]
Subject: RE: Wood Heater Rule Meeting Request

Hi Mandy,

I hope all is well on your end. Any chance we could schedule a meeting for this month or next?

Thanks,
Rachel

Rachel Feinstein
Manager - Government Affairs
Hearth, Patio & Barbecue Association (HPBA)
1901 North Moore St | Suite 600 | Arlington, VA 22209
E: feinstein@hpba.org
Work Ph: 703-522-0086 ext. 109
Cell Ph: 703-828-4724

On Thu, Apr 6, 2017 at 3:52 PM -0400, "Rachel Feinstein" <feinstein@hpba.org> wrote:

Hi Mandy,

Just following up on this. Any chance you have some time to meet this month?

Best,
Rachel



Rachel Feinstein | Manager - Government Affairs
Hearth, Patio & Barbecue Association
1901 North Moore Street, Suite 600 | Arlington, VA 22209
OFFICE: 703-522-0086 x 109 | **MOBILE:** 703-828-4724
Visit us online today! | feinstein@hpba.org

From: Rachel Feinstein
Sent: Wednesday, March 29, 2017 2:53 PM

To: Gunasekara.mandy@epa.gov
Cc: Ryan Carroll (carroll@hpba.org); 'Patrick Rita'
Subject: Wood Heater Rule Meeting Request

Hi Mandy,

Per our conversations during your time with EPW, we're currently involved in litigation against EPA challenging portions of its Clean Air Act standards for residential wood heaters. We (and other parties to the case) spent roughly one year negotiating with the prior administration in attempts to resolve our challenge out of court, so that litigation was temporarily put on hold. Despite those attempts, the prior administration abruptly cut off the negotiations in August 2016 and basically told us they'd see us in court. At the beginning of this year, the court set a briefing schedule for the litigation, but it recently granted us a 90 day extension of all deadlines, making our first brief due June 26 of this year. Our lawsuit focuses almost entirely on "Step 2" of EPA's rule (set to take effect May 15, 2020). This is a rule that regulates mostly small businesses who sell to largely rural customers that cannot afford to purchase wood burning appliances that cost several thousands of dollars, which is where the industry may be headed to comply with the 2020 standards.

We continue to believe that there are several aspects of the 2020 standards that will be difficult for EPA to defend and that it is both of our interests to avoid litigation and instead try to reach an out-of-court resolution. When you have time in your schedule, may we meet with you to discuss what EPA could do to ease some of the looming regulatory burdens on the wood heater industry?

Thank you for your consideration,
Rachel



Rachel Feinstein | Manager - Government Affairs
Hearth, Patio & Barbecue Association
1901 North Moore Street, Suite 600 | Arlington, VA 22209
OFFICE: 703-522-0086 x 109 | **MOBILE:** 703-828-4724
[Visit us online today!](#) | feinstein@hpba.org

Message

From: Gunasekara, Mandy [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=53D1A3CAA8BB4EBAB8A2D28CA59B6F45-GUNASEKARA,]
Sent: 3/21/2018 9:51:52 PM
To: Koerber, Mike [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=9c513901d4fd49f9ab101a6f7a7a863e-Koerber, Mike]; Harlow, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b5a9a34e31fc4fe6b2beaddda2affa44-Harlow, Dav]
CC: Tsirigotis, Peter [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=d19c179f3ccb4fadb48e3ae85563f132-PTSIRIGO]; Dominguez, Alexander [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=5ced433b4ef54171864ed98a36cb7a5f-Dominguez,]; Lewis, Josh [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=b22d1d3bb3f84436a524f76ab6c79d7e-JOLEWIS]
Subject: RE: Follow-up to wood heater discussion

Thank you, Mike. This is great. I've started the convo with OP and am looping in Justin as well. Please do go ahead and develop a public messaging draft.

Best,
Mandy

From: Koerber, Mike
Sent: Wednesday, March 21, 2018 5:37 PM
To: Harlow, David <harlow.david@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Cc: Tsirigotis, Peter <Tsirigotis.Peter@epa.gov>; Dominguez, Alexander <dominguez.alexander@epa.gov>; Lewis, Josh <Lewis.Josh@epa.gov>
Subject: RE: Follow-up to wood heater discussion

This time with the attachment!

From: Koerber, Mike
Sent: Wednesday, March 21, 2018 5:36 PM
To: Harlow, David <harlow.david@epa.gov>; Gunasekara, Mandy <Gunasekara.Mandy@epa.gov>
Cc: Tsirigotis, Peter <tsirigotis.peter@epa.gov>; Dominguez, Alexander <dominguez.alexander@epa.gov>; Lewis, Josh <Lewis.Josh@epa.gov>
Subject: Follow-up to wood heater discussion

Mandy, David – Here is the summary of the plan moving forward on wood heaters. We will share drafts of the NPRM and ANPR, as soon as they are available. Please let me know if you have any questions.

Also, attached below is a note from OGC related to next steps.

Attorney Client / Ex. 5

Attorney Client / Ex. 5

Mike

From: Jordan, Scott
Sent: Wednesday, March 21, 2018 3:08 PM
To: Koerber, Mike <Koerber.Mike@epa.gov>; Thompson, Fred <Thompson.Fred@epa.gov>; Edwards, Chebryll <Edwards.Chebryll@epa.gov>; Baumgart-Getz, Adam <Baumgart-Getz.Adam@epa.gov>; Aldridge, Amanda

<Aldridge.Amanda@epa.gov>; French, Chuck <French.Chuck@epa.gov>; Topham, Nathan <Topham.Nathan@epa.gov>;
Boyd, Rochelle <Boyd.Rochelle@epa.gov>; Howard, Jodi <Howard.Jodi@epa.gov>
Cc: Zenick, Elliott <Zenick.Elliott@epa.gov>; Simi Bhat <Simi.Bhat@usdoj.gov>
Subject: Wood Heaters Rule Review - Important Points re Timing of Signature on Package and Motion to Court

Ex. 5 Attorney Client Privilege/Attorney Work Product

Scott Jordan
Air and Radiation Law Office
Office of General Counsel
202-564-7508

Message

From: Alben T. Myren Jr [Personal Email / Ex. 6]@gmail.com]
Sent: 10/10/2017 3:46:15 AM
To: Johnson, Steffan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=eba5c0dfc5fc4593afa62ce7c3dd6f02-Johnson, Steffan]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Toney, Mike [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f0bc151675f34c3bb54f3bd1312b062d-MTONEY]; Cole, David [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a4566f82dd514c4e87d88ba239dc3192-DCOLE03]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]; lrector@nescaum.org; Bob Lebens [blebens@westar.org]; John Crouch [crouch@hpba.org]; Bob Ferguson [bob@far-consulting-vt.com]; Chris Neufeld [cneufeld@blazeking.com]; Justin White [JWhite@hearthstonestoves.com]
Subject: Comments on the 10.1.2017 draft of the one day cord wood test protocol
Attachments: 1 day revised 10.1.17 draft protocol comments 10.8.17.doc; One-day Stove Protocol 10 1 2017.docx

All, See attached. I am also providing a copy of the 10.1.17 draft of the 1 day protocol for your convience.

Look forward to your thoughts and comments. If you have any questions let me know. As John says this is way down in the "technical weeds", so if I use a term you are uncertain about, please contact me. The use of stove testing technical nomenclature often carries with it definitions that are specific to wood stove testing. I just ran into a similar issue in Germany. What they call secondary air is actually our air wash primary, etc, etc. We all need to be on the same sheet of music as we move forward.

We will be running a version of this draft next week, so thoughts on issues like fuel moisture readings, etc would be appreciated.

Regards,

Ben

Myren Consulting, Inc.

512 Williams Lake Road

Colville, WA 99114

Office: (509) 684-1154

Lab:

(509) 685-9458

email: Personal Email / Ex. 63 gmail.com

Date: 8 October 2017

To: Lisa Rector, NESCAUM

CC: Stef Johnson, EPA; Adam Baumgart-Getz, EPA; Mike Toney, EPA; Amanda Aldridge, EPA; David Cole, EPA; Bob Lebens, WESTAR; John Crouch, HPBA; Bob Ferguson, HPBA; Chris Neufeld, Blaze King; Justin White, Hearthstone

From: Ben Myren

RE: COMMENTS ON THE SECOND DRAFT OF THE 1 DAY CORD WOOD TEST PROTOCOL

What follows is a section by section review of the latest draft (10/1/17) of the 1 day cord wood test protocol. I have highlighted in red those sections which I feel are particularly at issue, especially since we are going to try to run this version of this protocol next week. And as I work with this draft I may find that additional corrections/ revisions are warranted.

Section 2.2 Emissions are to be measured as per EPA M5G. No mention is made of ASTM E2515 which is referenced in the 2015 NSPS and is now part of the measurement method, e.g., the procedures used to determine maximum allowable tunnel flow (See Sections 9.2.2 and 9.2.4 in ASTM E2515.)

Sections 3.9, 3.14 and 3.15. I would add the words "... or the equivalent amount of bark..." to each section to facilitate the use of as many cord wood pieces as possible. The protocol presently states that "...that at least half the pieces will have 30% bark on one side of the fuel piece...". So $0.5 \times .30 = 0.15$ or 15% of at least one side of all the fuel pieces must be cover with bark. If a 5 piece load had 1 piece with a side that was 100% covered by bark, that amount of bark would be deemed equivalent.

Section 3.25 Medium Burn Phase needs to be integrated into the definitions.

Section 6.2 The tolerance given for the platform scale of ± 0.02 kg (± 0.5 lb) would require everyone to probably buy new platform scales. 1000 lb x 0.1 lb platform scales do not work very well when set to weigh at this specification, if they can be set to do so.

Section 6.7 The specs for the anemometer given in Section 6.7 do not match the specs for allowable air movement in Section 6.12.2.

Section 6.12.1 The test facility temperature range is specified at 18-32 C (65-90 F). Yet in Section 7.1.3 the fuel temps are required "...to be at the test facility temperature of 18-32 C (50-90 F)". The room temperature spec in EPA M28 is 65-90 and the spec in ASTM E2515 is 50-90 F. The increase in allowable test facility temperature was because bigger tunnels with faster tunnel flows will tend to reduce room temperatures below 65 F.

Section 7.1.2 Fuel Moisture The spec in the 1 day protocol is 19-25% BD (16-20% WB) In the ASTM cord wood method the spec is 18-28% average for any piece and the average of all the pieces in a fuel load has to be between 19-25% DB. The increased allowable range was due to the wider variation in moisture contents found in cordwood. I would suggest making this change.

Section 7.1.4.1 Fuel Length As written the test fuel piece length is determined by the width of the stove with the width of the stove being defined in Section 3.23 as "...the shortest horizontal fire chamber dimension that is parallel to a wall of the chamber...". As written the fuel piece length of a N/S stove would now be based on the width of the stove, using the longest length of commercial fuel pieces available (14, 16, 18, 20 or 22" ± 1 ". (A N/S stove is loaded with longest dimension of the fuel pieces loaded perpendicular to the door opening.) This revision overturns over 30 years of precedent where fuel piece length was based upon the longest firebox dimension parallel to the floor of the firebox. (See EPA M28, Section 4.3.1.) What this would do to a N/S's stove's performance is totally unknown, but my guess is that it would be very hard to achieve the required loading density (weight) criteria with pieces that have to be of a certain diameter/ size without using a larger number of pieces, which would change the surface area to volume ratio and thus the way a N/S stove burns.

Sections 7.1.4.2.2, 7.1.4.2.3 and 7.1.4.2.4 As noted for Sections 3.9, 3.14 and 3.15, I would amend the bark requirement and add the words "...or equivalent amount of bark..." after the word "...piece..." in line 5. I also question the prohibition on the use of square pieces. It is very easy to produce fuel pieces that have a "square shape" with a hydraulic wood splitter, especially kindling and start-up fuel pieces.

Section 8.1.2 Table 1 and

Section 8.13.5.1 Paper Do we have to use paper? It may not be necessary. Let the use of paper be optional.

Section 8.13.1.5.2 Kindling

- A. all of the other fuel load weights contain a $\pm 5\%$ range criteria. Shouldn't Kindling also have the same $\pm 5\%$?
- B. the 1 lb/ ft³ loading density specification may not be enough kindling for large or high mass stoves. I would suggest increasing this requirement to 2.0 lbs./ ft³.
- B. Why are we limited to a "Log Cabin" style kindling fuel

arrangement? There is no justifiable reason for it.

Section 8.13.1.5.3 Start-Up fuel Section 8.13.1.5.3 contains a $\pm 5\%$ range criteria for Start-up fuel that is missing in Table 8.1.2.

Section 8.13.5.3 Table 1 requires that at least 70% of the fuel pieces in a Low burn fuel load be large pieces as defined in Section 3.9. Section 8.13.5.3 requires that a least 50% of the fuel pieces in a Low burn fuel load be large pieces as defined in Section 3.9. The 70% requirement is a change from the previous draft which was 50%. OK, so which is it?

Section 8.13.5.5 Table 1 shows a minimum loading density that is >10 lb/ ft³. Section 8.13.5.5 shows a minimum loading density that is >9.0 lb/ ft³. The 10 lbs/ ft³ is a change from the previous draft. OK, so, again, which is it?

General:

1. There is no recognition in this protocol of the fact that as useable firebox volumes (UFVs) increase, piece sizes also tend to get larger. The precedence for differentiation in fuel piece size based upon UFV was established in (OR DEQ's) OM7 (the original wood stove test method) and then carried forward into EPA M28. Are we now eliminating that concept?

2. Table 1 in Section 8.1.2 contains piece diameter requirements that are not found elsewhere in the fuel load specs.

Section 8.3.1 Requires 40 hours of aging instead of the 50 hours required in EPA M28R.

Section 8.3.2 Does "...Operate the wood heater using the operational protocol described in Section 8.13..." mean that we have to run repeated test cycles as per Section 8.13 to age the stove for the (40?) required number of hours of aging? It took us about 10-11 h to run one test cycle on a 2.1 ft³ stove, so that would mean at least 4 complete test cycles to age this stove. That is a very expensive way to age a stove!

Section 8.5 Shouldn't this section refer to Section 6.11, not EPA M5G, which is an incorrect reference. It should be EPA M28/ M28R, not M5G.

Section 8.9.1 The criteria specified for determining the depth of the moisture measurement locations is still what is in EPA M28/ M28R. This is totally inappropriate for cord wood. I would suggest that we use the criteria in Section 9.4.2.2 in the ASTM cord wood test method.

Section 8.12.1 I would add the words "...medium and..." before the word "...low..." in the 5th line. I also think the requirement to take weight data and wood heater temperature measurements every minute is a gross overkill. This is particularly true of the stove

temperatures which are just of general interest and not used for anything other than to determine the stove temperature at ignition.

Section 8.12.2 This section does not make much sense as presently written. I would suggest the following revision:

``The starting weight is the tare weight of the cleaned, dry wood heater with or without dry ash or sand added to the firebox in a manner that is consistent with the manufacturer's written operating instructions and the Owner's Manual. The tare weight of the wood heater must be determined with the wood heater (and ash or sand, if added) in a dry condition. The weight of the fuel in the stove at the start of a High, Medium or Low burn phase is determined by subtracting the dry tare weight of the wood heater from the weight of the wood heater with burning fuel in it...''

Section 8.13.1.1 This is a change from the previous requirement where both the average stove surface temperature and the stack temperature (at 8') could not be >10° F above ambient. Now the maximum ambient of 90° F is the maximum temperature allowed for a cold start.

Sections 8.13.2.6, 8.13.3.6 and 8.13.5.6: The requirement to load the High burn, Medium burn or Low burn fuel loads within 1 minute of the completion of the Start-up, High burn and Medium to Low transition phases is not viable. It takes much longer than a minute to break down (chop), level and then load a fuel load, especially if a filter set has to be swapped like at the end of the Start-up phase or to load a 5, 6 or 7 piece fuel load, like for a Low burn. This 1 minute requirement needs to be eliminated.

Section 8.13.3.7 This section makes absolutely no sense for cat stoves which can burn for a long periods of time on either medium or low without any visible flames in the firebox. Opening the door will only tend to reduce the stack temperatures, which will negatively affect the draft and thus the performance of the emission control system in the stove.

Section 8.13.3.8 To make sense, the word ``high...'' in the last line needs to be changed to ``medium...''.

Section 8.13.4.3 Again this requirement makes no sense because it will only tend to reduce the temperature in the firebox and thus negatively affect stove performance.

Section 8.13.5.7 The allowed unlimited (optional) adjustments of a burning Low burn fuel load any time there are no yellow flames in the firebox directly contradicts what has been allowed in M28 since the very beginning, i.e., no fuel load adjustments were allowed after 5 minutes into a test until at least 60% of the fuel load had been burnt and a ten minute period had elapsed without any discernable (0.1 lb.) weight loss.

As written, I think this section would open up the Low burn to substantial 'gaming' and would, therefore, introduce a large amount of variability into the test results.

Section 8.13.5.8 TYPO The word '...high...' needs to be replaced with '...low...'.

Section 8.13.6 What exactly needs to be reported? This requirement is totally ambiguous.

Section 8.13.7 What about Sections 8.13.1.6.3, 8.13.2.7, 8.13.3.7 and 8.13.4.3? They all include language that allows for fuel load adjustments.

Section 8.13.10 The 12 hour time requirement between runs may not be unnecessary for some stoves if they return to ambient temperature as defined in Section 8.13.1 in less than 12 hours.

Section 9.14 A statement of the uncertainty of any of these measurement methods would be highly questionable, especially for the %OE measurements since there is no such statement in CSA B415.

Section 9.15 Why is the CO plot based upon 1 minutes averages required? The language here would suggest that we will have to take more frequent CO readings and then average them to do the plot. And why do we need this plot?

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

Next Generation: A Test Method for Certification of Wood-Fired Stoves Using Cordwood: Measurement of Particulate Matter (PM) and Carbon Monoxide (CO) Emissions and Heating Efficiency

1. Scope and Application

- 1.1. Analyte. Particulate matter (PM). No CAS number assigned.
- 1.2. Applicability. This method is applicable for the certification and auditing of wood heaters, which burn cordwood fuel. Cordwood fuel is handfed. The test measures PM and CO emissions.
- 1.3. Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods

2. Summary of Method

- 2.1. Particulate matter emissions are measured from a wood heater burning a cordwood test fuel in a test facility maintained at a set of prescribed conditions. Procedures for operating the appliance, measuring PM and CO emission rates, and methods for reducing data and calculating results are provided.
- 2.2. PM emissions are measured by the dilution tunnel method as specified in EPA Method 5G.

3. Definitions

- 3.1. Certification or audit test means a series of at three test runs conducted for certification or audit purposes that meets the specifications in Section 8.
- 3.2. Chop – means using a poker or another piece of wood to strike a piece of the fuel charge to break it into smaller pieces.
- 3.3. Coal-bed Stirring – prior to adding a new fuel charge. The coal bed can be stirred or leveled to ease loading of the fuel charge.
- 3.4. Firebox means the chamber in the wood heater in which the test fuel charge is placed and combusted.
- 3.5. Firebox Height - means the vertical distance extending above the loading door, if fuel could reasonably occupy that space, but not more than 2 inches above the top (peak height) of the loading door, to the floor of the firebox (i.e., below a permanent grate) if the grate allows a 1-inch diameter piece of wood to pass through the grate, or, if not, to the top of the grate. Firebox height is not necessarily uniform but must account for variations caused by internal baffles, air channels, or other permanent obstructions.
- 3.6. Fuel Adjustment – Fuel adjustments are manipulations to the fuel charge to reflect typical owner practices that will allow the cordwood fuel to burn appropriately during

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

the test period. A fuel adjustment does not include chopping the wood or stirring the coal bed. A fuel adjustment is minimal movement of a fuel charge piece or pieces.

- 3.7. High-burn Phase – period of the test when the unit has a coal bed and the stoves air settings are fully open.
- 3.8. Kindling pieces – small pieces of wood less than 1” in diameter. No bark requirements for these pieces.
- 3.9. Large Fuel pieces - pieces of cordwood that can fit through a circle of seven inch diameter but not through a circle of five inch diameter. Each piece shall be free from decay, fungus and loose bark. But bark that is attached to the piece shall remain. At least half the fuel charge pieces will have at least 30% bark on one side of the piece.
- 3.10. Firebox Length means the longest horizontal fire chamber dimension that is parallel to a wall of the chamber.
- 3.11. Low-burn Phase – period of the test when the unit has a coal bed and the stoves air settings are at their lowest settings.
- 3.12. Medium to low burn transition – period between the medium and low burn phase where the stove must meet certain conditions before the low phase begins.
- 3.13. Secondary air supply means an air supply that introduces air to the wood heater such that the burn rate is not altered by more than 10 percent when the secondary air supply is adjusted during the test run. The wood heater manufacturer can document this through design drawings that show the secondary air is introduced only into a mixing chamber or secondary chamber outside the firebox.
- 3.14. Small Fuel Pieces - pieces of cordwood that can fit through a circle of 5 inch diameter but not through a circle of three inch diameter. Each piece shall be free from decay, fungus and loose bark. But bark that is attached to the piece shall remain. At least half the fuel charge pieces will have at least 30% bark on one side of the piece.
- 3.15. Starter Fuel – pieces of cordwood that can fit through a circle of three inch diameter but not through a circle of one inch diameter. Each piece shall be free from decay, fungus and loose bark. But bark that is attached to the piece shall remain. At least half the fuel charge pieces will have at least 30% bark on one side of the piece.
- 3.16. Start-up Phase – period of the test when the unit has kindling and start-up fuel. Stove is cold and no coal bed exists. Stove air settings are fully open.
- 3.17. Test facility means the area in which the wood heater is installed, operated, and sampled for emissions.
- 3.18. Test fuel charge means the collection of test fuel pieces placed in the wood heater during the four phases of the emission test run.
- 3.19. Test fuel loading means the arrangement of the test fuel charge

Commented [LR1]: Need to work with Bob on fueling calculator

Commented [LR2]: Need to work with Bob on fueling calculator

Commented [LR3]: :ibid

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

- 3.20. Test fuel loading density means the weight of the as-fired test fuel charge per unit volume of usable firebox.
- 3.21. Test run means an individual emission test which encompasses the time required to run the device in the four operational phases and consume 90% of the mass of the four test fuel charges encompassed within the test.
- 3.22. Usable firebox volume means the volume of the firebox determined using its height, length, and width as defined in this section.
- 3.23. Width means the shortest horizontal fire chamber dimension that is parallel to a wall of the chamber.
- 3.24. Wood heater means an enclosed, wood burning appliance capable of and intended for space heating or domestic water heating, as defined in the applicable regulation
Medium-burn Phase – period of the test when the unit has a coal bed and the stoves air settings are in the medium setting as defined by manufacturer's instructions.

4. *Interferences*

[Reserved]

5. *Safety*

- 5.1. Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to performing this test method.

6. *Equipment and Supplies*

Same as Section 6.0 of either Method 5G, with the addition of the following:

- 6.1. Insulated Solid Pack Chimney. For installation of wood heaters. Solid pack insulated chimneys shall have a minimum of 2.5 cm (1 in.) solid pack insulating material surrounding the entire flue and possess a label demonstrating conformance to U.L. 103 (incorporated by reference—see §60.17).
- 6.2. Platform Scale and Monitor. For monitoring of fuel load weight change. The scale shall be capable of measuring weight to within 0.02 kg (0.05 lb).
- 6.3. Wood Heater Temperature Monitors. Seven, each capable of measuring temperature with standard Type J or K thermocouple accuracy of +/- 0.75% of expected absolute temperatures.
- 6.4. Test Facility Temperature Monitor. A thermocouple, or other equivalent device, located centrally in a vertically oriented 150 mm (6 in.) long, 50 mm (2 in.) diameter pipe shield that is open at both ends, capable of measuring temperature to within 2.2C of expected temperatures.

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

- 6.5. Balance (optional). Balance capable of weighing the test fuel charge to within 0.02 kg (0.05 lb).
- 6.6. Moisture Meter. Calibrated electrical resistance meter for measuring test fuel moisture to within 1 percent moisture content.
- 6.7. Anemometer. Device capable of detecting air velocities less than 0.10 m/sec (20 ft/min), for measuring air velocities near the test appliance.
- 6.8. Barometer. Aneroid or other barometer capable of measuring atmospheric pressure to within 2.5 mm Hg (0.1 in. Hg).
- 6.9. Draft Gauge. Electromanometer or other device for the determination of flue draft or static pressure readable to within 0.50 Pa (0.002 in. H₂O)
- 6.10. Humidity Gauge. Psychrometer or hygrometer for measuring room humidity.
- 6.11. Wood Heater Flue.
 - 6.11.1. Steel flue pipe extending to 2.6 ± 0.15 m (8.5 ± 0.5 ft) above the top of the platform scale, and above this level, insulated solid pack type chimney extending to 4.6 ± 0.3 m (15 ± 1 ft) above the platform scale, and of the size specified by the wood heater manufacturer. This applies to both freestanding and inserts type wood heaters.
 - 6.11.2. Other chimney types (e.g., solid pack insulated pipe) may be used in place of the steel flue pipe if the wood heater manufacturer's written appliance specifications require such chimney for home installation (e.g., zero clearance wood heater inserts). Such alternative chimney or flue pipe must remain and be sealed with the wood heater following the certification test.
- 6.12. Test Facility. The test facility shall meet the following requirements during testing:
 - 6.12.1. The test facility temperature shall be maintained between 18 and 32°C (65 and 90°F) during each test run.
 - 6.12.2. Air velocities within 0.6 m (2 ft) of the test appliance and exhaust system shall be less than 0.25 m/sec (50 ft/min) without fire in the unit.
 - 6.12.3. The flue shall discharge into the same space or into a space freely communicating with the test facility. Any hood or similar device used to vent combustion products shall not induce a draft greater than 1.25 Pa (0.005 in. H₂O) on the wood heater measured when the wood heater is not operating.
 - 6.12.4. For test facilities with artificially induced barometric pressures (e.g., pressurized chambers), the barometric pressure in the test facility shall not exceed 775 mm Hg (30.5 in. Hg) during any test run.

7. Reagents and Standards

- 7.1. Test Fuel. The test fuel shall conform to the following requirements:
 - 7.1.1. Fuel Species. Untreated, air-dried, cordwood fuel.
 - 7.1.1.1. Allowable species: maple, ash, western larch, and birch.
 - 7.1.1.2. Kiln-dried fuel is not permitted.
 - 7.1.1.3. Fuel shall be free of decay, fungus or other contaminants.

Commented [LR4]: Need to work with group on species selection

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

7.1.2. Fuel Moisture. The test fuel shall have a moisture content range between 16 to 20 percent on a wet basis (19 to 25 percent dry basis). Addition of moisture to previously dried wood is not allowed. It is recommended that the test fuel be stored in a temperature and humidity-controlled room.

7.1.3. Fuel Temperature. The test fuel shall be at the test facility temperature of 18 to 32°C (50 to 90°F).

7.1.4. Fuel Dimensions. The dimensions of each test fuel piece shall conform to definitions specified in Section 8.13.

7.1.4.1. Fuel length: The length of the piece will be determined by measuring the length and width of the stove. The length of the test fuel will be determined by the width of the stove and determining the largest length of commercial fuel pieces available (14, 16, 18, 20 or 22 inches in length for use +/- 1"). For example an East/West stove with a width of 17 inches will use test fuel 16 inch in length. Each piece of test fuel (not including kindling) shall be of equal length.

Commented [LR5]: Need to work with Ben to address his concerns about piece length.

7.1.4.2. Fuel Diameter

Commented [LR6]: Work with Bob F on fuel load sizes and calculations.

7.1.4.2.1. Kindling - small pieces of wood less than 1" in diameter. No bark requirements for these pieces. No species requirements. No moisture requirements. No length requirements for these pieces.

7.1.4.2.2. Starter fuel: pieces of cordwood that can fit through a circle three inch in diameter but not through a circle one inch in diameter. No length requirements for these pieces. The fuel charge must meet the bark requirement that at least half the pieces will have 30% bark on one side of the fuel piece and shall be triangular, irregular, or circular in shape. Use of square pieces shall be avoided.

7.1.4.2.3. Small pieces: pieces of cordwood that can fit through a circle five inches in diameter but not through a circle three inches in diameter. The fuel charge must meet the bark requirement that at least half the pieces will have 30% bark on one side of the fuel piece and shall be triangular, irregular, or circular in shape. Use of square pieces shall be avoided.

7.1.4.2.4. Large pieces - pieces of cordwood that can fit through a circle seven inches in diameter but not through a circle five inches in diameter. The fuel charge must meet the bark requirement that at least half the pieces will have 30% bark on one side of the fuel piece and shall be triangular, irregular, or circular in shape. Use of square pieces shall be avoided.

8. Sample Collection, Preservation, Storage, and Transport

8.1. Test Run Requirements.

8.1.1. User Guide – the manufacturer must supply a one page user guide that will direct certain portions (as indicated) of the test protocol and will be provided to the

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

consumer as a laminated single sheet. The user guide shall address key user operations and conform to the following requirements:

8.1.1.1. Layout requirements

8.1.1.1.1. Directions must be illustrated by text and pictures

8.1.1.1.1.1. Font size must be at least 12.

8.1.1.1.1.2. Must fit on a single side of an 8 x11.5 inch sheet of paper.

8.1.1.1.1.3. Must be provided in laminated form to the consumer.

8.1.1.1.2. Must address the following items

8.1.1.1.2.1. Stove preparation – what must be done to the stove prior to starting a fire.

8.1.1.1.2.2. Fuel properties – what types of fuel and fuel moisture requirements.

8.1.1.1.2.3. Start-up procedures – guidelines for properly starting a fire in the stove.

8.1.1.1.2.4. Reloading procedures – guidelines for properly reloading fuel once a fire has been started in the stove.

8.1.1.1.2.5. Air settings – define air settings for medium burn

8.1.2. Burn Phase Categories. Each emission test run must include five phases: start-up, high-fire, medium fire, medium to low transition, and low fire. The following describes the operational protocol for conducting a test run. The order that each phase is described is the order that test run must follow. Order of the burn phases cannot be changed. Table 1 provides a summary of the protocol.

Table 1. Woodstove Cordwood Protocol

<i>Burn Phase</i>	<i>Load Parameters</i>	<i>Air Settings</i>	<i>Operational Parameters</i>	<i>End of Phase Definition</i>
Start-up	<input type="checkbox"/> Crumple 4 to 6 pieces of newspaper in the bottom <input type="checkbox"/> Load kindling - log cabin style for this test <input type="checkbox"/> Kindling Loading density: 1 lb per cubic foot for dry kindling <input type="checkbox"/> Load starter fuel: all starter fuel can be added at once or added at any interval <input type="checkbox"/> Loading density: 3 lb per cubic foot <input type="checkbox"/> Size: fit through a 3 inch circle but not a 1-inch circle	<input type="checkbox"/> fully open	<input type="checkbox"/> Start fire according to manufacturer's instructions. Use of a torch is acceptable for up to 15 seconds. <input type="checkbox"/> Door may be in any position for up to 5 minutes <input type="checkbox"/> Unlimited poking and stirring during cold start phase	<input type="checkbox"/> End of start-up phase defined as 20% of the start-up phase fuel charge weight
High Fire	<input type="checkbox"/> Loading density: 5 lb per cubic ft (+/- 5%) <input type="checkbox"/> Size: Small pieces (3-5 inch round cross sectional equivalent).	<input type="checkbox"/> Fully open	<input type="checkbox"/> Open door <input type="checkbox"/> load high fire load <input type="checkbox"/> Door closed immediately <input type="checkbox"/> Allow one fuel adjustment during burn period	<input type="checkbox"/> 90% of the fuel charge is burned
Medium Fire	<input type="checkbox"/> Loading density: 7 lb per cubic ft (+/- 5%) <input type="checkbox"/> Size: Large pieces (5-7 inch	<input type="checkbox"/> Mid-point setting immediately after loading fuel.	<input type="checkbox"/> Open door <input type="checkbox"/> Load med fire load <input type="checkbox"/> Door closed	<input type="checkbox"/> 90% of the medium-phase fuel charge has been consumed

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

	round cross sectional equivalent).		<input type="checkbox"/> immediately Require one fuel adjustment during burn period when there is no flame	
Medium to low fire transition	<input type="checkbox"/> No fuel loaded	<input type="checkbox"/> Air settings moved to low	<input type="checkbox"/> Mandatory chop after medium fire ends	<input type="checkbox"/> No yellow flame or at least 95% of fuel consumed (if a unit doesn't have glass front)
Low Fire	<input type="checkbox"/> Loading density: as much as can be reasonably loaded, determine weight after starting low load portion must be great than 10 lb/ft ³ <input type="checkbox"/> Size: at least 70% of the pieces loaded should be large pieces, additional space should be filled with small pieces.	<input type="checkbox"/> Air settings may be adjusted for first 10 minutes of phase then adjust to low setting by minute 10	<input type="checkbox"/> Open door <input type="checkbox"/> load low fire load <input type="checkbox"/> Door may be open for up to five minutes <input type="checkbox"/> Air settings may be adjusted for up to 10 minutes	<input type="checkbox"/> Test ends when 90% of low fire fuel charge consumed

8.2. If a wood heater cannot be operated at the settings specified in the test procedure, the test run is a failed run. If after three attempts to run the device according to the protocol, the unit cannot maintain a fire, the unit has failed the test.

8.3. Catalytic Combustor and Wood Heater Aging. The catalyst-equipped wood heater or a wood heater of any type shall be aged before the certification test begins. The aging procedure shall be conducted and documented by a testing laboratory accredited according to procedures in Section 11.

8.3.1. Catalyst-equipped Wood Heater. Operate the catalyst-equipped wood heater using fuel cordwood with moisture content between 15 and 25 percent on a wet basis. Operate the wood heater at a variety burn phases with the catalytic combustor engaged according to manufacturer's instructions and operate for at least 40 hours. Record air settings used and note the time spent in each air setting phase. Report hourly catalyst exit temperature data and the hours of operation.

8.3.2. Non-Catalyst Wood Heater. Operate the wood heater using the operational protocol described in Section 8.13 for at least 40 hours. Record and report the hours of operation.

8.4. Pretest Recordkeeping. Record the test fuel charge weights for the start-up, high fire, medium fire and low fire charges. For each charge record the number of pieces in the charge, moisture content of each piece and weight of each piece. Obtain photo documentation and description of wood heater, catalysts (if applicable), and fuel charges.

8.5. Wood Heater Installation. Assemble the wood heater appliance and parts in conformance with the manufacturer's written installation instructions. Place the wood heater centrally on the platform scale and connect the wood heater to the flue described in Method 5G. Clean the flue with an appropriately sized, wire chimney brush before each certification test.

8.6. Wood Heater Temperature Monitors.

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

- 8.6.1. For catalyst-equipped wood heaters, locate a temperature monitor (optional) about 25 mm (1 in.) upstream of the catalyst at the centroid of the catalyst face area, and locate a temperature monitor (mandatory) that will indicate the catalyst exhaust temperature. This temperature monitor is centrally located within 25 mm (1 in.) downstream at the centroid of catalyst face area. Record these locations.
 - 8.6.2. Locate wood heater surface temperature monitors at five locations on the wood heater firebox exterior surface. Position the temperature monitors centrally on the top surface, on two sidewall surfaces, and on the bottom and back surfaces. Position the monitor sensing tip on the firebox exterior surface inside of any heat shield, air circulation walls, or other wall or shield separated from the firebox exterior surface. Surface temperature locations for unusual design shapes (e.g., spherical, etc.) shall be positioned so that there are four surface temperature monitors in both the vertical and horizontal planes passing at right angles through the centroid of the firebox, not including the fuel loading door (total of five temperature monitors).
- 8.7. Test Facility Conditions.
- 8.7.1. Locate the test facility temperature monitor on the horizontal plane that includes the primary air intake opening for the wood heater. Locate the temperature monitor 1 to 2 m (3 to 6 ft) from the front of the wood heater in the 90° sector in front of the wood heater.
 - 8.7.2. Use an anemometer to measure the air velocity. Measure and record the room air velocity before the pretest ignition period (Section 8.7) and once immediately following the test run completion.
 - 8.7.3. Measure and record the test facility's ambient relative humidity, barometric pressure, and temperature before and after each test run.
 - 8.7.4. Measure and record the flue draft or static pressure in the flue at a location no greater than 0.3 m (1ft) above the flue connector at the wood heater exhaust during the test run at the recording intervals
- 8.8. Wood Heater Firebox Volume.
- 8.8.1. Determine the firebox volume using the definitions for height, width, and length in Section 3. Volume adjustments due to presence of firebrick and other permanent fixtures may be necessary. Adjust width and length dimensions to extend to the metal wall of the wood heater above the firebrick or permanent obstruction if the firebrick or obstruction extending the length of the side(s) or back wall extends less than one-third of the usable firebox height. Use the width or length dimensions inside the firebrick if the firebrick extends more than one-third of the usable firebox height. If a log retainer or grate is a permanent fixture and the manufacturer recommends that no fuel be placed outside the retainer, the area outside of the retainer is excluded from the firebox volume calculations
 - 8.8.2. In general, exclude the area above the ash lip if that area is less than 10 percent of the usable firebox volume. Otherwise, take into account consumer loading practices.

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

For instance, if fuel is to be loaded front-to-back, an ash lip may be considered usable firebox volume.

- 8.8.3. Include areas adjacent to and above a baffle (up to two inches above the fuel loading opening) if four inches or more horizontal space exist between the edge of the baffle and a vertical obstruction (e.g., sidewalls or air channels).

8.9. Test Fuel Charge.

- 8.9.1. Prepare the test fuel pieces in accordance with the specifications outlined in Sections 7. Determine the test fuel moisture content with a calibrated electrical resistance meter or other equivalent performance meter. If necessary, convert fuel moisture content values from dry basis (%Md) to wet basis (%Mw). Determine fuel moisture for each fuel piece by averaging at least three moisture meter readings, one from each of three sides, measured parallel to the wood grain. Average all the readings for all the fuel pieces in the test fuel charge. If an electrical resistance type meter is used, penetration of insulated electrodes shall be one-fourth the thickness of the test fuel piece or 19 mm (0.75 in.), whichever is greater. Measure the fuel moisture content within 4 hours of use in testing. Determine the fuel temperature by measuring the temperature of the room where the wood has been stored for at least 24 hours prior to the moisture determination.

8.10. Sampling Equipment. Prepare the sampling equipment as defined by EPA Method 5G.

8.11. Secondary Air Adjustment Validation.

- 8.11.1. If design drawings do not show the introduction of secondary air into a chamber outside the firebox (see “secondary air supply” under Section 3.0, Definitions), conduct a separate test of the wood heater's secondary air supply. Operate the wood heater at a low burn phase settings (Section 8.13.5) with the secondary air supply operated following the manufacturer's written instructions. Start the secondary air validation test run as described in Section 8.11, except no emission sampling is necessary and burn rate data shall be recorded at 5-minute intervals.
- 8.11.2. After the start of the test run, operate the wood heater with the secondary air supply set as per the manufacturer's instructions, but with no adjustments to this setting. After 25 percent of the test fuel has been consumed, adjust the secondary air supply controls to another setting, as per the manufacturer's instructions. Record the burn rate data (5-minute intervals) for 20 minutes following the air supply adjustment.
- 8.11.3. Adjust the air supply control(s) to the original position(s), operate at this condition for at least 20 minutes, and repeat the air supply adjustment procedure above. Repeat the procedure three times at equal intervals over the entire burn period as defined in Section 8.13. If the secondary air adjustment results in a burn rate change of more than an average of 10 percent between the 20-minute periods before and after the secondary adjustments, the secondary air supply shall be considered a

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

primary air supply, and no adjustment to this air supply is allowed during the test run and air settings must conform to phase setting requirements.

- 8.11.4. The example sequence below describes a typical secondary air adjustment validation check. The first cycle begins after at least 25 percent of the test fuel charge has been consumed.

Cycle 1

Part 1, sec air adjusted to final position—20 min

Part 2, sec air adjusted to final position—20 min

Part 3, sec air adjusted to final position—20 min

Cycle 2

Part 1, sec air adjusted to final position—20 min

Part 2, sec air adjusted to final position—20 min

Part 3, sec air adjusted to final position—20 min

Cycle 3

Part 1, sec air adjusted to final position—20 min

Part 2, sec air adjusted to final position—20 min

Part 3, sec air adjusted to final position—20 min

Note that the cycles may overlap; that is, Part 3 of Cycle 1 may coincide in part or in total with Part 1 of Cycle 2. The calculation of the secondary air percent effect for this example is as follows:

8.12. Instructions

- 8.12.1. Wood Heater Operation and Adjustments. Set the air inlet supply controls as designated in the operational protocol in Section 8.13. For the purposes of this method, coalbed raking is the use of a metal tool (poker) to stir coals, break burning fuel into smaller pieces, dislodge fuel pieces from positions of poor combustion, and check for the condition of uniform charcoalization for the low-fire phase. Record all adjustments made to the air supply controls, adjustments to and additions or subtractions of fuel, and any other changes to wood heater operations that occur during the test period. Record fuel weight data and wood heater temperature measurements at 1-minute intervals.

- 8.12.2. The weight of fuel remaining at the start of the test run is determined as the difference between the weight of the wood heater with the remaining coals and fuel and the weight after loading the fuel charge. The starting weight is the tare weight of the cleaned, dry wood heater with or without dry ash or sand added consistent with the manufacturer's instructions and the owner's manual. The tare weight of the wood heater must be determined with the wood heater (and ash, if added) in a dry condition.

8.13. Test Run. Complete a test run in each burn rate category, as follows:

8.13.1. Start-up Phase

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

- 8.13.1.1. Stove temperature: internal and external stove temp must not be greater than 90F.
- 8.13.1.2. Record the weight of the stove prior to initiating the test and record the weight of the start-up fuel charge prior to loading.
- 8.13.1.3. Loading structure: start-up loading structure using bottom-up or an alternative method detailed in the user guide.
- 8.13.1.4. Fuel type – during the start-up phase newspaper, kindling and starter fuel pieces are used.
- 8.13.1.5. Loading Density
 - 8.13.1.5.1. Crumple 4-8 pieces of newspaper
 - 8.13.1.5.2. Kindling loading density: 1 lb per cubic foot for dry kindling
 - 8.13.1.5.3. Starter Fuel loading density: 3 lb per cubic foot, +/- 5%
- 8.13.1.6. Operational Parameters:
 - 8.13.1.6.1. All kindling and newspaper must be in the firebox for light off. Starter fuel may be added at any interval during the startup phase including from the cold start.
 - 8.13.1.6.1.1. Structure of load is determined by manufacturers' instructions
 - 8.13.1.6.1.2. Air settings are fully open unless manufacturers' instructions specify otherwise.
 - 8.13.1.6.2. Door can be open for 5 minutes
 - 8.13.1.6.3. Fuel Adjustments: unlimited poking and stirring during cold start phase
- 8.13.1.7. End of Phase – the end of the start-up phase is when the scale indicates that less than 20% of the High-fire load mass remains in the firebox.
- 8.13.2. *High-fire Phase* – the high fire phase commences immediately after the start-up phase ends.
 - 8.13.2.1. Stove temperature: no stove temperature requirements.
 - 8.13.2.2. Record the weight of the stove prior to loading the high-fire fuel charge, the load of the fuel charge prior to loading, and the scale weight after loading the high-fire fuel charge.
 - 8.13.2.3. Fuel type – during the high-fire phase small cordwood pieces are used.
 - 8.13.2.4. Loading structure: fuel will be loaded in a random pattern unless otherwise specified by the written user instructions.
 - 8.13.2.5. High-fire loading density: 5 lb per cubic foot, +/- 5%
 - 8.13.2.6. Operational Parameters: Open door upon completion of the start-up phase and load the high fire fuel charge within one minute of the end of the start-up phase. Door is closed immediately and air settings are fully open.
 - 8.13.2.7. Fuel Adjustments: Allow one fuel adjustment during burn period
 - 8.13.2.8. End of Phase – the end of the high-fire phase is as when the scale indicates that 90% of the total high-fire fuel charge has been consumed.

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

- 8.13.3. *Medium-fire Phase* – the medium-fire phase commences immediately after the high-fire phase ends.
- 8.13.3.1. Stove temperature: no stove temperature requirements.
 - 8.13.3.2. Record the weight of the stove prior to loading the medium-fire fuel charge, the load of the fuel charge prior to loading, and the scale weight after loading the medium-fire fuel charge.
 - 8.13.3.3. Fuel type – during the medium-fire phase large cordwood pieces are used.
 - 8.13.3.4. Loading structure: fuel will be loaded in a random pattern unless otherwise specified by the written user instructions.
 - 8.13.3.5. Medium-fire loading density: 7 lb per cubic foot, +/- 5%
 - 8.13.3.6. Operational Parameters: Open door upon completion of the high-fire phase and load the medium-fire fuel charge within one minute of the end of the high-fire phase. Door is closed immediately and air settings are moved to the mid-point setting as defined by the manufacturer.
 - 8.13.3.7. Fuel Adjustments: If there is no yellow flame at any point during the medium-fire phase, a fuel adjustment to obtain yellow flame is required.
 - 8.13.3.8. End of Phase – the end of the medium-fire phase is when the scale indicates that 90% of the total high-fire fuel charge has been consumed.
- 8.13.4. *Medium-fire to Low-fire Transition* – the medium to low-fire phase transition commences immediately after the medium-fire phase ends. The purpose of the medium to low transition phase is to achieve a uniform charcoalization of the test fuel bed prior to loading the test fuel charge. Uniform charcoalization is a general condition of the test fuel bed evidenced by an absence of large pieces of burning wood in the coal bed and the remaining fuel pieces being brittle enough to be broken into smaller charcoal pieces with a metal poker.
- 8.13.4.1. Stove temperature: no stove temperature requirements.
 - 8.13.4.2. Fuel type – there is no fueling during this phase.
 - 8.13.4.3. Operational Parameters: Air settings are moved to the low setting. Open door and chop and stir coal bed. Any unburnt wood should be chopped and pulled to the front. Door is closed after chop and stir procedures have been completed. This operation is repeated every 15 minutes until the end of the transition phase.
 - 8.13.4.4. End of Phase –
 - 8.13.4.4.1. Stoves with glass front, when no yellow flame is visible, or when the scale indicates that 95% of the total medium-fire fuel charge has been consumed, whichever comes first.
 - 8.13.4.4.2. Stove that do not have a glass window, when the scale indicates that 95% of the total medium-fire fuel charge has been consumed.
- 8.13.5. *Low-fire Phase* – the low-fire phase commences immediately after the medium to low-fire transition ends.

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

- 8.13.5.1. Stove temperature: no stove temperature requirements.
- 8.13.5.2. Record the weight of the stove prior to loading the low-fire fuel charge, the load of the fuel charge prior to loading, and the scale weight after loading the low-fire fuel charge.
- 8.13.5.3. Fuel type – during the low-fire phase a mix of small and large cordwood pieces are used. At least 50% of the fuel charge load, by number of pieces, must be large pieces.
- 8.13.5.4. Loading structure: fuel will be loaded in a random pattern.
- 8.13.5.5. Low-fire loading density: Fuel will be loaded with as many pieces as possible. Fuel will be loaded to the top of the height of the firebox. The loading volume will be calculated by measuring the total weight of all the possible pieces that could be loaded. After loading is completed, weigh the pieces not used and subtract from the earlier weight. Record the loading density. Low-fire phase load density must be greater than 9 lb/ft³.
- 8.13.5.6. Operational Parameters: Open door upon completion of the medium to low phase transition. Load the low-fire fuel charge within one minute of the end of the medium to low-fire transition. Door may remain open for up to five minutes. Air settings may be placed at any air setting within the first ten minutes of the phase. After ten minutes, air settings must be at the lowest position.
- 8.13.5.7. Fuel Adjustments: If there is no yellow flame at any point during the low-fire phase, a fuel adjustment can be used to obtain flame.
- 8.13.5.8. End of Phase – the end of the low-fire phase is when the scale indicates that 90% of the total high-fire fuel charge has been consumed.
- 8.13.6. Data Recording. – two test component phases will be recorded and reported.
 - 8.13.6.1. Start-up Measurement. A measurement of the start-up phase will be reported.
 - 8.13.6.2. Integrated load measurement. A measurement of the high, medium, medium to low transition and low burn will be reported.
- 8.13.7. Test Fuel Charge Adjustments: are allowed only as specified in section 8.13.5.
- 8.13.8. Auxiliary Wood Heater Equipment Operation. Heat exchange blowers sold with the wood heater shall be operated during the test run following the manufacturer's written instructions. If no manufacturer's written instructions are available, operate the heat exchange blower in the "high" position. (Automatically operated blowers shall be operated as designed.) Shaker grates, by-pass controls, or other auxiliary equipment may be adjusted only one time during the test run following the manufacturer's written instructions. Record all adjustments on a wood heater operational written record. Note: If the wood heater is sold with a heat exchange blower as an option, test the wood heater with the heat exchange blower operating at the setting recommended in the manufacturer's instructions. Blowers may be turned

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

off for the start-up phase and during reloading event. The heat exchange blower must operate in all other phases when the loading door is closed.

8.13.9. Test Run Completion. Test runs ends when all five phases of the test run have been completed and 90% of the low fire test fuel charge has been consumed.

8.13.10. Consecutive Test Runs. Consecutive test runs shall be conducted after a period of at least 12 hours after the completion of the previous run.

8.13.11. Invalid Test Runs

8.13.12. Calculating results. The start-up emissions shall be collected separately from the other phases. The high, medium and low fire phase will be integrated into a single emission results.

8.13.12.1. Test Series completion. A complete test series is defined as successful completion of three full test runs.

8.13.12.2. Additional Test Runs. The testing laboratory may conduct more than three test runs. If more than three test runs are conducted, the results from all valid test runs shall be used in calculating the average emission rate. The measurement data and results of all test runs shall be reported regardless of which values are used in calculating the emission rate.

Commented [LR7]: Need to discuss this item with the group.

Commented [LR8]: Need to address what constitutes and invalid run.

9. *Reporting Requirements.* The report shall include the following:

- 9.1. Name and location of the laboratory conducting the test.
- 9.2. A description of the appliance tested and its condition, date of receipt and dates of tests.
- 9.3. A statement that the test results apply only to the specific appliance tested.
- 9.4. A statement that the test report shall not be reproduced except in full, without the written approval of the laboratory.
- 9.5. A description of the test procedures and test equipment including a schematic or other drawing showing the location of all required test equipment. Also, a description of test fuel sourcing, handling and storage practices shall be included.
- 9.6. Details of deviations from, additions to or exclusions from the test method, and their data quality implications on the test results (if any), as well as information on specific test conditions, such as environmental conditions.
- 9.7. A list of participants and their roles and observers present for the tests. List shall include the participants name, title , company and the purpose of their participation.
- 9.8. Data and drawings indicating the fire box size and location of the fuel charge.
- 9.9. Drawings and calculations used to determine firebox volume.
- 9.10. For each test run, Information for each test phase fuel charge including number of pieces, individual piece weights, piece length, moisture content and weight.
- 9.11. All required data and applicable blanks for each test run shall be provided in spreadsheet format both in the printed report and in a computer file such that the data can be easily analyzed and calculations easily verified. Formulas used for all calculations shall be accessible for review.
- 9.12. For each test run, $\Theta_1, \Theta_2, \Theta_3$, the total CO and particulate emission for (1) the start-up

NextGen Cordwood Stove Testing – p. [PAGE * MERGEFORMAT]

phase and (2) high-, medium-, and low-fire phases.

9.13. Calculated results for the emissions reported as total emissions in grams, pounds per million Btu, grams per MJ, grams per kilogram of dry fuel and grams per hour.

9.14. A statement of the estimated uncertainty of measurement of the emissions and efficiency test results.

9.15. A plot of CO emission rate in grams/minute vs. time, based on 1 minute averages, for the entire test period, for each run.

9.16. Raw data, calibration records, and other relevant documentation shall be retained by the laboratory for a minimum of 7 years.

Message

From: Alben T. Myren Jr [Personal Email / Ex. 6]@gmail.com]
Sent: 9/15/2017 2:57:20 PM
To: Johnson, Steffan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=eba5c0dfc5fc4593afa62ce7c3dd6f02-Johnson, Steffan]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Toney, Mike [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f0bc151675f34c3bb54f3bd1312b062d-MTONEY]; Aldridge, Amanda [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=76646ca7dc41494c9435d78174cb6054-AALDRI02]; lrector@nescaum.org; Ellen G. Burkhard [egb@nyserda.ny.gov]; Bob Ferguson [bob@far-consulting-vt.com]; John Crouch [crouch@hpba.org]; Bob Lebens [blebens@westar.org]
Subject: Moisture Condensation
Attachments: EPA MOISTURE CONDENSION MEMO 9.15.17.doc

All, See attached memo. Ben

Myren Consulting, Inc.

512 Williams Lake Road

Colville, WA 99114

Office: (509) 684-1154 Lab: (509) 685-9458
Fax: (509) 684-3987 email: Personal Email / Ex. 6@gmail.com

Date: 15 September 2017

To: Stef Johnson, EPA

CC: Adam Baumgart-Getz, EPA; Amanda Aldridge, EPA; Mike Toney, EPA; Lisa Rector, NESCAUM, Ellen Burkhart, NYSERDA; Bob Lebens, WESTAR; John Crouch, HPBA; Bob Ferguson, HPBA

From: Ben Myren

RE: MOISTURE CONDENSATION IN PM SAMPLING TRAINS

Yesterday another reason for the difference in the amount of moisture condensation that occurs in PM sampling trains surfaced. Specifically, Lisa stated that a tunnel flow of ~200 dscfm has been/ is being used in the cord wood/ crib fuel research being done at Hearthlab Solutions and elsewhere. All of the work done at Myren Consulting used a tunnel flow of ~140 dscfm, which is what is specified/ required in the 1988 NSPS in EPA M5G Section 4.2.1 and in ASTM E2515-10 Section 9.2.2 as modified by the 100% smoke capture results determined as per E2515-10 Section 9.2.4. In my lab it turns out that 5 times the minimum tunnel flow for 100% smoke capture is ~140 dscfm for wood stoves. While there is nothing "wrong" with the use of the increased tunnel flow for research projects, the 42.86% increase in tunnel flow $((200-140)/140)$ does change the dynamics of the entire PM sampling process. And due to the *Law of Unintended Consequences*, this difference in tunnel flow can have a substantial impact on other aspects of the PM sampling process, e.g., moisture condensation in the sampling trains and a reduced sample catch.

I am raising this issue now because of its potential impact on the sampling procedures and the test results generated by the use of either the ASTM cord wood test protocol or the eventual Cord Wood Federal Reference Method. If the research done to generate data uses different criteria, e.g., tunnel flow, than what is in the standards used for actual certification testing and the standards used

for certification testing are not revised accordingly, then we have the potential for some major problems surfacing. I just reread the final report dated August 9, 2017 titled "*Wood Species Testing Using Crib and Cordwood in a Pre-NSPS Residential Wood Heater*" for the work done at Hearthlab Solutions and could not find any mention of what the actual tunnel flow used was other than the following statement in *Section 4.1 Sampling Procedure*:

"...Constant dilution tunnel and sample flows were carefully maintained in an effort to reduce operation variation allowed by ASTM 2515, with the goal being to ensure higher precision for the nature of the data outputs required..." (P. 4)

Since it does not specifically mention the use of a tunnel flow of ~200 dscfm, at least this reader assumed that the tunnel flow used during this study would be within "Spec", i.e., ~140 dscfm. Had the 200 dscfm been reported, the difference in tunnel flows would have quickly explained why there was such a difference in the moisture condensation in the PM sampling trains, i.e., the air required for the extra tunnel flow was diluting the exhaust exiting the stack on the stove sufficiently so no condensation was occurring. Whether this extra tunnel flow will prevent condensation when (1.) the amount of excess air in the stove's exhaust is reduced to an absolute minimum and/ or (2.) when much larger fuel loads (30 plus pounds) with much larger amounts of water are used during testing remains to be seen. While I can not speak for the others who contributed to the development of the ASTM Cord Wood Test Method, I can state unequivocally that all of the work done by Myren Consulting in support of developing the ASTM Cord wood test method and the KIWI 2.1 VcV stove used a tunnel flow of ~140 dscfm simply because changing the tunnel flow was never an option that was put on the table simply because that was what the regulations required. If you can't go there, you don't go there!

FYI, one of the things on the testing agenda for the lab session in October is specifically aimed at looking at this issue.

I look forward to your thoughts and comments.

Regards,
Ben Myren

Message

From: Sanchez, Rafael [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=D26B2AFD849E403FA022A1E14E5DE7FF-SANCHEZ, RAFAEL]
Sent: 7/30/2017 5:05:50 PM
To: Alben T. Myren Jr [Personal Email / Ex. 6]@gmail.com]; WoodHeaterReports [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=33749f03a4ba41ba8e3a0b4b20826012-WoodHeaterR]; Baumgart-Getz, Adam [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=a7437fa04b43497c9c2a0c821e51ff56-Baumgart-Getz, Adam]; Johnson, Steffan [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=eba5c0dfc5fc4593afa62ce7c3dd6f02-Johnson, Steffan]; Toney, Mike [/o=ExchangeLabs/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=f0bc151675f34c3bb54f3bd1312b062d-MTONEY]; John Crouch [crouch@hpba.org]; Tom Bassett [heattechstoves@gmail.com]
Subject: Re: "Reciprocal certifications" for the HEAT TECH HTP 26 Standard and Bay pellet stoves.

Thanks Ben.

Tom - I will need to get the model names associated with those model lines added to Ben's conformity letter. If you have any questions, please let me know.

Rafael Sanchez, PhD
Wood Heater Program Lead

From: Alben T. Myren Jr [Personal Email / Ex. 6]@gmail.com>
Sent: Saturday, July 29, 2017 2:58:21 PM
To: Sanchez, Rafael; WoodHeaterReports; Baumgart-Getz, Adam; Johnson, Steffan; Toney, Mike; John Crouch; Tom Bassett
Subject: Re: "Reciprocal certifications" for the HEAT TECH HTP 26 Standard and Bay pellet stoves.

ALL, When I checked my sent mail. it looks like the doc was not attached. Here it is. Ben

On Sat, Jul 29, 2017 at 11:19 AM, Alben T. Myren Jr [Personal Email / Ex. 6]@gmail.com> wrote:
Rafael,

I am providing the attached memo in support of "reciprocal certifications"/ waiver from additional testing for the Heat Tech HTP 26 Standard and Bay pellet stoves. If you or anyone else has any questions about this matter, please feel free to contact me immediately.

FYI, The 2 test units were returned to the manufacturer via common carrier (Fastway) on Friday.

Regards,

Ben